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An Examination of an Emerging Stock Exchange: The Case of Turkish Stock Market.

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An examination of an emerging stock exchange: The case of Turkish stock market

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AN EXAMINATION OF AN EMERGING STOCK EXCHANGE:
THE CASE OF TURKISH STOCK MARKET

A Dissertation

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ABSTRACT

This dissertation investigates an emerging stock market: Istanbul Stock Exchange. First the organizational properties and the history of the exchange are presented. The dissertation then provides an extensive statistical study of the time series properties of the Turkish stock prices. It shows that the Turkish stocks are nonnormal and highly leptokurtic. Absolute value of the stocks show significant dependence. The dissertation examines the effects of Decree No. 32 of August 11, 1989 on the stock distributions. After this date the stock market removed the restrictions on foreign investors. It is shown that the mean of stock price changes has stayed the same, but the variances changed significantly with this government decision. The variances of the majority of the stock prices (36 out of 56) increased after August 11, 1989. And lastly, it examines the diversification with Turkish stocks by forming portfolios. It is shown that with portfolios of 10-15 stocks 80% of the variance of the unexpected prices can be diversified.

CHAPTER 1

INTRODUCTION

Over the last two decades, the flow of capital across national borders has become much less restricted. Investors have begun including assets of foreign countries into their portfolios in an effort to further reduce risk and diversify effectively. At the same time, developing countries that borrowed heavily from commercial banks during the 1970, have realized that the external capital markets are not the only, nor necessarily the best source of funds for development. The claims of international creditors during times of recession create financial burdens on developing countries. In an effort to obtain capital from different sources, some developing countries have established their own stock markets while others that already had stock markets have decreased restrictions on foreign investment.

As the market for capital becomes more global and less local, the importance of stock exchanges outside the developed countries increases. Investors perceive that growth opportunities are greater in those nations that are not yet economically mature. This new prominence has not gone unnoticed, as the popular press is rife with articles describing how best to exploit investment opportunities in emerging markets such as Mexico and Taiwan, and Korea. Table 1.1 gives the percentage change in price indexes and in exchange rates of emerging markets for over the one year period between March 1990 and March 1991. The return data in terms of U.S. dollars for a recent five-year period for 20 emerging markets are given in Table 1.2.

TABLE 1.1
PERCENT CHANGE IN MARKET PRICE INDEXES AND EXCHANGE RATES
(Between March 1990 and March 1991)

	Exchange Rates (relative to US$) (%)	Price Indexes (in local currency) (%)
Latin America		
Argentina	-51.61	287.97
Brazil	-82.02	783.04
Chile	-17.11	84.60
Colombia	-19.15	-
Mexico	-7.25	64.08
Venezuela	-20.29	409.31
East Asia		
Korea	-4.71	-21.52
Philippines	-19.12	-28.75
Taiwan	-1.93	-52.21
South Asia		
India	-11.51	35.19
Indonesia	-5.48	-32.99
Malaysia	-1.46	0.60
Pakistan	-6.16	10.73
Thailand	1.41	1.66
Europe/Mideast/Africa		
Greece	-7.80	92.31
Jordan	-0.39	-2.65
Nigeria	-16.97	68.82
Portugal	0.57	-19.00
Turkey	-33.03	37.24
Zimbabwe	-18.45	104.90

Source: Quarterly Review of Emerging Stock Markets, First Quarter 1991, *IFC*

TABLE 1.2
STATISTICS OF EMERGING MARKETS RETURN INDEXES
(In US$; 5 years ending March 1991)

	Annualized Mean (%)	Annualized Standard Deviation (%)
Latin America		
Argentina	79.08	111.61
Brazil	14.52	78.64
Chile	51.36	29.17
Colombia	33.48	21.69
Mexico	65.40	54.04
Venezuela	59.28	47.63
East Asia		
Korea	25.32	29.79
Philippines	49.08	43.02
Taiwan	55.44	63.22
South Asia		
India	9.72	30.10
Indonesia	3.48	34.19
Malaysia	24.60	29.27
Pakistan	11.04	10.63
Thailand	50.28	33.01
Europe/Mideast/Africa		
Greece	58.68	54.35
Jordan	0.24	18.22
Nigeria	1.92	39.59
Portugal	52.20	56.43
Turkey	132.60	110.44
Zimbabwe	40.80	20.54
Developed Markets		
EAFE	15.60	22.31
U.S.	14.28	18.74

Source: Quarterly Review of Emerging Stock Markets, First Quarter 1991, *IFC*

Until recently, very little was known about the statistical properties and diversification possibilities of emerging markets. Traditionally investors avoided these markets because of the political risks involved and also because of restrictions against foreign investors in these markets. However, in recent years the political risk of emerging markets has reduced tremendously. Additionally, there exists a trend within developing countries to ease the restrictions that discourage foreign investment.

Errunza (1985) examines the statistical properties of 10 emerging stock exchanges (Brazil, Chile, Greece, India, Korea, Argentina, Mexico, Thailand, Taiwan and Malaysia) and compares the statistical and distributional characteristics of the stock returns with those of the developed stock exchanges. He concludes that the statistical properties of emerging market stocks are similar to those of the smaller European exchanges.

In this dissertation the Istanbul Stock Exchange is examined. The Istanbul Stock Exchange is a good candidate for academic research because it is not only one of the newest exchanges, but also one of the fastest growing. Market capitalization of the exchange has doubled from $9,477,000 to $18,819,000 over the last year(1992-1993). It is now the largest exchange in the Middle East. Another reason to investigate the Istanbul Stock Exchange is that over the next decade Turkey is expected to become a full member of European Community. Turkey applied for membership in the EC on July 31, 1959. The provisions of the Additional

Protocol stipulate the gradual realization of the Customs Union between Turkey and the Community until 1995. In 1995 the final phase of the relations of Turkey with the Community will begin, and Turkey will start discussing the conditions of her admission to the European Community as a full member.

The distributional form and behavior of returns on securities and portfolios have been the focus of financial research since the pioneering work of Bachelier (1900). The hypothesis that security prices follow a random walk can be trace back to this seminal work. Fama (1965) examines the distributions of continuously compounded daily returns for each of the 30 stocks of the Dow Jones Industrial Average. His results indicate that the independence assumption does not appear to be violated and the frequency distributions of daily returns have more observations in their central portion and in the extreme tails than are expected from normal distributions. Fama concludes that distributions that are leptokurtic relative to normal distributions may be appropriate for security return models.

Mandelbrot (1963) assumes that stock returns are identically and independently distributed. However, the distributions have fatter tails than a normal distribution. He suggests that security returns may be best represented by one of the family of stable distributions. Other popular models include the Student t, proposed by Blattberg and Gonedes (1974), the compound normal, suggested by Oldfield, Rogalski and Jarrow (1977), and the mixed diffusion jump model, introduced by Kon (1984).

In recent years, researchers have begun to question the independence of successive price changes. Bollerslev (1987) and Akgiray (1989) show that the U.S. stock returns exhibit not only leptokurtosis but also significant nonlinear dependence. The results of both articles indicate that a conditional autoregressive model fits stock return data reasonably well. Nonlinear dependencies in Finnish and German stock returns are reported by Booth, et al.(1992) and by Akgiray, Booth and Loistl (1989a), respectively.

The question of whether the international stock markets are fully integrated or are segmented is of interest to financial economists. Since one cannot deny the existence of investment barriers to international investment, it is natural to conclude that markets are segmented. The degree of segmentation depends on the effectiveness of investment barriers. Any international asset pricing model is flawed if it does not address the presence of these barriers.

The difficulty of formulating a model with investment barriers stems from the fact that there are various kinds of barriers that make it very difficult to represent all barriers in one model.

Black (1974) and Stulz (1981) assume that barriers to international investment occur as a proportionate tax on foreign holdings and form asset pricing models in the presence of these taxes. Both researchers conclude that if these barriers imposed by the government are effective then they cause segmentation among markets and individual investors no longer hold a mixture of national portfolios as their optimal risky portfolios.

Errunza and Losq (1985) develop a model under mild segmentation assuming that a class of investors are prohibited from trading a subset of securities as a result of government restrictions. The type of imperfection takes the form of restriction on the percentage of foreign equity ownership in Eun and Janakiramanan (1986). In both models these restrictions create super risk premiums for the ineligible securities or for the domestic investors who are restricted by the foreign governments.

Beginning in the mid 1970s, both developed and developing countries removed foreign investment barriers in order to encourage foreign investors to invest in their country. Errunza and Losq (1989) predict that the removal of restrictions leads to an increase in the aggregate market value of the affected securities and improve the welfare of the country. Bonser-Neal, et al. (1990) and Gultekin, Gultekin and Penati (1989) all find that removal of restrictions cause markets to be more integrated and less segmented.

The Istanbul Stock Exchange removed all the barriers to foreign investment with Decree No 32 (August 11, 1989), giving (1) foreign investors the right to invest in Turkish stocks and mutual funds without getting the permission of the government and (2) domestic investors the right to invest in foreign markets.

Risk reduction via portfolio formation is the subject of much research. Using data from the New York Stock Exchange, the empirical evidence indicates that most of the benefits of diversification can be achieved with fewer than 15 stocks. For example, Wagner and Lau (1971) demonstrate that portfolios consisting of 10 to 15 randomly selected securities are approximately free of idiosyncratic risk. Studies by Fama (1976) and Ibbotson and Sinquefield (1986) support the work of Wagner and Lau. Solnik (1975) investigates the degree of risk that can be eliminated within a market by forming random portfolios of stocks in European markets. His results indicate that the effectiveness of diversification in reducing risk varies considerably from country to country.

This dissertation first examines the statistical properties of Turkish stocks listed on the Istanbul Stock Exchange. Then the properties of the stocks before and after August 11, 1989 are compared. Finally portfolio diversification before and after August 11, 1989 and for the whole period are investigated.

In Chapter 2, the history and institutional characteristics of the Istanbul Stock Exchange are examined.

The trading system, the specific rules of the exchange are introduced and the Istanbul Stock Exchange is compared with the other emerging stock exchanges. In Chapter 3, the data are described and whether the normality and the strict white noise processes fit the price change series are tested. It is shown that majority of the stocks do not exhibit dependence in the mean or in the variance. However, absolute price changes exhibit time dependence. In this chapter the distribution of the price changes before and after August 11, 1989 are compared to ascertain whether the opening of the exchange to foreign investors caused statistically significant changes in the price change distributions. The evidence indicates that the Decree No 32 did not affect the mean of the series. However, the variances of the majority of the stocks changed significantly after the opening of the market. It is concluded that the opening of the market to international investors caused a structural change in price distributions. In Chapter 4, risk reduction and portfolio formation in the Istanbul Stock Exchange are examined. The results indicate that effective risk reduction is possible in the exchange and investors reduce risk 80% by forming portfolios of 15-20 securities. The dissertation is concluded in Chapter 5 with a discussion of the results and areas of future research.

This dissertation provides an extensive study about one of the new emerging markets. The literature does not contain an extensive study about the Istanbul Stock Exchange. The study first introduces the history and the organizational characteristics of the stock exchange. In the following chapters an extensive statistical study of the Turkish stock prices are made. The dissertation will help not only to researchers of the Istanbul Stock Exchange, but also to academicians of emerging stock markets.

CHAPTER 2

INSTITUTIONAL CHARACTERISTICS OF THE ISTANBUL STOCK EXCHANGE

The new Istanbul Stock Exchange began its operations on January 2, 1986. It is one of the newest of the emerging stock exchanges, yet historically Turkey had one of the first stock exchanges in the world. First the volume and the market capitalization of the Istanbul Stock Exchange are compared with those of the other emerging stock exchanges.

In this chapter, the institutional properties of the Istanbul Stock Exchange are investigated. The chapter starts with the history of the stock market within the Ottoman era and continues with the developments in the Turkish Republic. Then the organizations ,trading system, settling and clearance, and short sales provisions are discussed.

2.A. VOLUME OF TURKISH STOCK EXCHANGE IN COMPARISON WITH OTHER EMERGING AND DEVELOPED MARKETS

Until recently, securities markets in developing countries were virtually ignored among the international financial community. Market capitalization of these markets in September 1991 is given by Table 2.1. The figures are in terms of U.S dollars. The trading volume of the Istanbul Stock Exchange exceeded that of the Chilean, Venezuelan, Columbian, Portuguese and Greek stock markets in September 1991. Many analysts and academicians think that some some emerging markets (Taiwan and Korea) should be analyzed as developed markets, because their market capitalizations have increased dramatically in the last 5 years. The market

TABLE 2.1
MARKET CAPITALIZATION AND THE MONTHLY VOLUME TRADED IN EMERGING MARKETS, September 1991 (US$ Millions)

	Trade	Market Capitalization
Latin America		
Argentina	699.5	12,002
Brazil	1,145.6	33,857
Chile	208.4	32,320
Colombia	36.5	1,645
Mexico	5,264.7	76,287
Venezuela	108.8	8,734
East Asia		
Korea	5,754.7	113,094
Philippines	98.9	9,276
Taiwan	15,850.7	123,658
South Asia		
India	1,349.2	37,558
Indonesia	166.1	6,251
Malaysia	536.2	54,791
Pakistan	46.5	4,371
Thailand	2,258.0	29,157
Europe/Mideast/Africa		
Greece	135.7	12,720
Jordan	20.1	2,333
Nigeria	0.7	1,803
Portugal	136.7	10,139
Turkey	415.6	11,641
Zimbabwe	7.8	1,843
Scandinavia		
Denmark	1,749.2	26,900
Finland	68.2	10,800
Norway	1,493.0	15,100
Sweden	1,951.2	53,400
Developed Markets		
EAFE		5,818,000
Japan		2,989,000
U.K.		955,000
U.S.		3,402,000

Source: IFC (International Finance Corporation) Monthly Update on Emerging Markets. India includes Bombay only; Brazil Sao Paulo only for market capitalization. Scandinavian markets' figures are from Morgan Stanley Capital Perspective.

TABLE 2.2
MARKET CAPITALIZATION AND THE MONTHLY VOLUME TRADED IN EMERGING MARKETS, March 1991 (Millions)

	Trade	Market Capitalization	Turnover Ratio
Latin America			
Argentina	1,793,309	49,974,832	4.3
Brazil	112,805	5,797,244	1.9
Chile	33,721	6,736,962	0.5
Colombia	3,603	811,851	0.4
Mexico	4,257,048	116,429,705	3.9
Venezuela	6,524	496,354	1.3
East Asia			
Korea	4,620,474	76,240,702	6.0
Philippines	3,277	243,175	1.4
Taiwan	1,104,381	3,339,103	34.0
South Asia			
India	14,386	532,417	2.6
Indonesia	478,246	15,315,221	3.2
Malaysia	5,213	162,557	3.3
Pakistan	812	71,528	1.2
Thailand	99,800	892,053	12.0
Europe/Mideast/Africa			
Greece	81,275	3,010,769	2.7
Jordan	21	1,445	1.5
Nigeria	8	14,302	0.0
Portugal	26,325	1,464,936	1.8
Turkey	2,748,620	68,707,593	3.8
Zimbabwe	14	7,065	0.2

Source : IFC (International Finance Corporation) Quarterly Review of Emerging. India includes Bombay only; Brazil Sao Paulo only for market capitalization.

capitalization of the Istanbul Stock Exchange is less than those of Argentina and Greece, but greater than those of Portugal and Venezuela. The Istanbul Stock Exchange is the fastest growing emerging stock exchange except for the

Taiwanese and Korean markets over the last five years. Table 2.2 exhibits the market capitalization, trading volume and the turnover ratios of these markets in terms of their local currency. The numbers in Table 2.2 are the monthly figures of March, 1991. The Turkish Stock Exchange is fourth after those of Thailand, Argentina and Mexico in terms of turnover ratios.

2.B. HISTORY

The beginning of exchange activities in the Ottoman Empire dates back to the Crimean War (1853-1856). During that war, the government borrowed heavily from foreign governments and the public by issuing domestic and foreign bonds. After the war, a group of minorities started buying and selling these bonds. The government decided to regulate these activities and issued a decree regarding the establishment of an exchange. The foreign governments from which the Ottoman government borrowed heavily also wanted to create a market for their government bonds and company stocks. They forced the Sultan to establish an exchange as well.

The first official stock exchange in Istanbul was opened in 1866. This stock exchange, which was called *Dersaadet Tahvil Borsasi*, operated under a system that was very similar to that of the French Bourse. The minorities living in the empire (the Armenians, Greeks, and the Jews) continued to be the primary bankers and participants in this exchange. Until

1910, only European government bonds and the stocks of foreign companies operating in Istanbul were handled by the exchange. After 1910, however, the list of securities was expanded to include the stock of the national railroad companies and that of the natural gas and coal mine companies.

In the 1890s, Istanbul's *Dersaadet Tahvil Borsasi* was among the leading exchanges in Europe. In fact, in 1895 the Istanbul Stock Exchange was second only to the London Stock Exchange in terms of transaction volume. The credibility of the exchange was weakened, however, between 1900 and 1905, because of scandals and fraudulent acts of various brokers. The government closed the Exchange for four months. In 1906, a new security law was passed that imposed new regulations and prohibited foreigners from becoming members of the exchange.

The sectoral distribution of the foreign capital stock in two different periods (1888 and 1913) are given by Table 2.3 and 2.4. All transactions in the Exchange were made with British pounds. These figures are taken from a manual prepared by E. Pech (1911), an employee of the Ottoman Bank. According to his figures there were more than 80 joint stock companies that were controlled by foreign capital and operating in the Ottoman Empire in 1910.

In the environment of intense inter-imperialist rivalry over the Ottoman Empire, each European country attempted to

TABLE 2.3
SECTORAL DISTRIBUTION OF THE FOREIGN CAPITAL AT THE BEGINNING OF 1888
(Figures indicate sum of paid in capital and debentures in thousands of pounds)

	FRENCH	%	BRITISH	%	GERMAN	%	TOTAL	SECTOR
RAILROADS	648	12.3	3349	63.3	166	3.1	5283	33.4%
UTILITIES	87	5.9	961	65.3			1472	9.3%
BANKING	2500	50.0	2500	50.0			5000	31.6%
COMMERCE	700	54.7	580	45.3			1280	8.1%
INDUSTRY	900	47.5	795	42.0			1895	12.0%
MINING	185	20.7	710	79.3			895	5.6%
TOTAL DIRECT INVESTMENT	5020	31.7	8895	56.2	166	1.1	15825	
STATE DEBT IN 1890	44600	37.6	27400	23.1	13800	11.7	118500	
TOTAL	49620		36295		13966		134325	

Source: *Manuel des societes anonymes fonctionnant en Turquie* by E. Perch, 1911, Constantinople

TABLE 2.4
SECTORAL DISTRIBUTION OF THE FOREIGN CAPITAL AT THE BEGINNING OF 1913
(Figures indicate sum of paid in capital and debentures in thousands of pounds)

	FRENCH	%	BRITISH	%	GERMAN	%	TOTAL	SECTOR
RAILROADS	23247	49.6	4588	9.8	17248	36.8	46868	63.1%
PORTS	2206	69.1	409	12.8	576	18.1	3191	4.3%
UTILITIES	1701	44.6	363	9.5	304	8.0	3817	5.1%
BANKING	3400	38.2	2950	33.1	1750	19.7	8900	12.0%
INSURANCE	450	81.8	100	18.2			550	0.7%
COMMERCE	3031	70.7	757	17.6	300	7.0	4288	5.8%
INDUSTRY	1220	30.8	1665	42.1	300	7.6	3959	5.3%
MINING	2007	73.5	450	16.5	175	6.4	2732	3.7%
TOTAL DIRECT INVESTMENT	37262	50.4	11282	15.3	20653	27.5	74305	
STATE DEBT	75300	53.0	19900	14.0	29900	21.0	142200	
TOTAL	112562	52.0	31182	14.9	50553	23.2	216505	

Source: *Manuel des societes anonymes fonctionnant en Turquie* by E. Perch, 1911, Constantinople

prevent the participation of other countries in their ventures. France was by far the largest investor in the public debt. The British gradually reduced their holdings while the Germans rapidly increased theirs in the two decades before the First World War. In railways, British investors took an early lead but soon lost interest and sold the Izmir line to French and the Mersin line to German interests. The underlying reason behind this is that during different time periods in the life of the Ottoman Empire, various advisors to Sultan favored different European countries and administrations. The advisors of Sultan Abdulmecit favored the British and French companies. Later the advisors of Sultan Abdulhamit II and the officers of the *Ittihat ve Terakki* party favored the German railroad companies.

The modernization and the so called westernization of the Ottoman Empire started in 1839. In this year, the Sultan proclaimed a reform charter inspired and largely drafted by his Minister of Foreign Affairs, Mustafa Resit Pasha. The Charter, known as the *Tanzimat Charter*, provided for the protection of life, property and honor of all the citizens regardless of their religious and ethnic backgrounds and stated that the government was in future to be based on fundamental laws. The educational reforms of the *Tanzimat* down-graded the religious personnel who had staffed the overwhelming majority of educational institutions. In 1868 French Minister of Education, Victor Duruy opened a high school called *Galatasaray* in Istanbul. The courses were given in French and many generations of Turks who later held important positions in the administration came to see civilization, the ultimate aim of the founding fathers of the

Tanzimat, through French eyes. Beginning in the 1840s graduates of the Military Academy were sent abroad to complete their military training. Ataturk, the founder of the modern Turkish Republic, was sent to Germany. Most of these young officers were influenced heavily by German system and formed a party called *Ittihat ve Terakki*. Through this party they forced the Sultan to allow a congress and give certain powers to the congress. After a period of civil unrest, the Sultan agreed to form a congress and to hold elections.

In late 1800s *Ittihat ve Terakki* threw the Sultan out and seized power. They exiled the Sultan to a distant palace where he was to be under house arrest. The party leaders formed a coalition with the German administration. As a result of this coalition the Ottoman Empire entered the First World War in alliance with Germans.

The exchange was closed during the World War I. After the Independence War and the declaration of the Republic, Decree No 1447 established a new exchange in 1929. The new Turkish republican government canceled the capitulations of the foreign governments and nationalized all the companies operating within the borders of the republic.[1] The new

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[1] Capitulations refer to certain trade rights given by Sultans to foreign governments. The first capitulation was given by *Suleyman the Magnificent* to France. According to the first capitulation, only ships of French government or merchants could import goods to Ottoman Empire. Historians (e.g. Enver Ziya Karal) cited the capitulations as one of the major reasons of the collapse of the Ottoman Empire.

exchange was called the *Istanbul Menkul Kiymetler ve Kambiyo Borsasi*.

In 1936, the government at Ankara passed a law prohibiting foreigners from taking part in exchange operations and prohibiting Turkish citizens from buying and selling securities on foreign exchanges. In 1938, the government moved the exchange from Istanbul to Ankara, a newly formed city that did not have the potential for trade, much less investments. Ankara was chosen as the capital of the newly formed Turkish republic by Ataturk. At that time Istanbul was a cosmopolitan city full of foreigners and secret agents of the last Sultan and the foreign governments. Ataturk did not feel that the new administration function safely and properly in Istanbul. So he chose the geographical center of the Anatolian peninsula as the capital of the republic. Ankara was a village at that time. All the big merchants, investors and people who participate in trading activities stayed in Istanbul. Recognizing its error, the government moved the exchange back to Istanbul in 1941. In the meantime, however, Turkish investors lost confidence in the exchange.

During the Second World War Turkey remained neutral. But the war imposed a heavy strain on the economy. Industrial production increased by 50%, but investment declined and per capita income fell by about a 25%. State intervention increased and the government decided to collect a new capital tax, *Varlik Vergisi*, that was intended to tax war profits. It was applied in a highly discriminatory way, 315 million Turkish Liras (TL) collected being levied on minorities. Many of the minorities were forced into bankruptcy , and others transferred their funds abroad and left the country.

During 1947-1975 Turkey received $ 2,823 million in U.S. grants and credits. Under the Marshall plan, 40,000 tractors were imported. Agricultural and industrial output rose rapidly. Turkish entrepreneurs began to fill the vacuum left by the minorities and formed new companies. There were only 421 joint stock companies in 1943 with a capital of TL 245 million. In 1950 the number of companies rose to 782 with a capital of TL 875 million. Between 1951 and 1957 more than 1703 companies with a capital of TL 15000 million were founded.

In the 1960s, the government issued the so called "savings bonds and freedom bonds". Civil officers and federal government employees were forced to use 10 percent of their paychecks to buy these bonds. Government contractors were paid with these bonds. Federal employees and the contractors decided to get rid of these instruments, since the interest on them was only 6 percent while the market interest rate was 12 percent. Some intermediaries bought these bonds at a large discount and presented the bonds to the government at maturity, and received large profits. All of these events discouraged Turkish investors from buying stock certificates and bonds issued by the government. At that time, most private companies in Turkey were family owned and operated. In the 1970s, these companies established their own banks to obtain less expensive financing. As a result of these factors, Turkish investors preferred real estate and gold as the primary instruments of long term investment until the 1980s. The financial sector was dominated by banks and security markets were nearly nonexistent at that time.

In the 1980s, Turkish investors started to invest large amounts of money into promissory notes of the so called "bankers". The Central Bank had no control over the bankers. Literally anyone could become a banker and offer notes with high interest rates. In the early 1980s, the Turkish financial sector experienced a trauma, "the bankers event". The primary cause of "the bankers event" was the hyperinflation (80-90%) of that period. Hyperinflation caused the interest earned on the certificates and bonds to be negative in terms of real earnings. The laws during that period prohibited firms and banks from adjusting the interest rates according to the current inflation rate. The Central Bank supervised the banks regarding their intermediary activities. As a result, the bond interest rate remained at 28 percent while the inflation rate was nearly 80 percent. These circumstances created the secondary market. At that time there were no regulations regarding the third parties in the market. The bankers issued their own certificates with high interest rates and provided issues of corporation or banks as collateral. Bankers collected billions of Turkish Liras under these conditions and never reinvested these funds prudently. Instead, most of them spent the funds for their own consumption and then escaped overseas at the maturity of the certificates. In 1981 various small bankers ended their activities and declared bankruptcy. In July 1982, even the largest and the most organized banker (Kastelli) declared bankruptcy. The Bankers Event caused the government to prepare and pass the Capital Market Law on July 28, 1981. With this law, the Capital Market Board was established as the primary regulatory and supervisory authority of the security exchange.

In 1983, the government issued a new decree concerning the operation of a security exchange. Subsequently, the new Istanbul Stock Exchange was established on January 1, 1986. The new exchange is a semi-autonomous organization whose operations are controlled by a Capital Markets Board.

The trading system in the Istanbul Stock Exchange was a call market until November 17, 1987. In November 1987, the Istanbul Stock Exchange adopted the continuous auction trading system on the senior market. At the beginning three markets were established for the stocks. The most liquid stocks were traded on the senior market. The less liquid stocks were traded on the junior market. Stocks that were not listed on either the senior market or on the junior market were traded on the unlisted market. On June 11, 1990, the stock exchange merged the senior market with the junior market. The exchange's executives decided to automate and computerize the trading system over the next few years, adopting the system called STRATUS. This is the computer system that is used in the Vancouver and Caracas Stock Exchanges.

The stock exchange will move to a new location at Istinye province of Istanbul in late 1993. At the new location some of the operations will be automated. The executives of the stock exchange hope that the full automation will be accomplished within two years. The manager of the computer and the automation department of the Istanbul Stock Exchange said a committee chose this system (STRATUS), because the company (TCAM) that produces STRATUS, provided the cheapest deal, a long term service program and also two similar size stock exchanges (Vancouver and Caracas) are already using this system in their automation process and are satisfied with the system.[2]

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[2] The manager of the computer department of the Istanbul Stock Exchange said that TCAM (an American company that has headquarters in Massachusetts) gave the cheapest bid and agreed to give free educational seminars for the managers and staff of the exchange in the USA and to send a group of American experts to Istanbul to work with the staff on automation.

2.C. ORGANIZATION

There are three different kinds of exchange members: 1) banks; 2) stock brokerage houses; and 3) brokers. In order to work as an intermediary in the exchange, banks should have separate security departments, pay entrance fees, and get permission from the Board. Initially two types of brokerage houses were established: a) limited partnerships with at least 1 billion TL capital (A type companies allowed to participate in underwriting activities of the senior market); b) limited partnerships with at least 250 million TL capital (B type companies allowed to participate in underwriting activities of junior market). Stock brokers, on the other hand, should have at least 25 million TL capital and their membership must be approved by the board. Exchange members can make transactions both for their customers and for themselves. They charge the same commission schedule from the customers. The commission schedule is as follows:

On the first TL 15 million	1.0%
On the next TL 35 million	0.8%
On the next TL 50 million	0.6%
On the next TL 100 million	0.4%
On amounts above TL 100 million	0.2%

Members must also deposit funds in the Central Bank to compensate for damages they may cause to the exchange and to the customers.

The Executive Council consists of one president and four members. The president is appointed by the prime minister. Each of the three types of exchange members choose one representative (banks choose two) to serve on the council. There are three committees in the exchange:
1) the listing committee, 2) the disciplinary committee, and 3) the committee on the settlement of disputes.

Under extraordinary conditions the president can close the exchange for three days.[3] The board may do so for 15 days.

Intermediaries can help market the issues of companies either by best-effort marketing or by the stand-by underwriting method. Both methods are acceptable according to Capital Market Law. The majority of intermediation is done by best-efforts marketing. Initially the law required a written contract between the intermediary and the company for the senior market securities. The law also states that the commission fee cannot exceed 5 percent of the value of the security.

Banks can conduct underwriting activities through their investment departments, but they are required to sell the securities within 6 months. After this period if the banks want to include these securities into their portfolios they must get permission of the Capital Markets Board.

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[3] The Capital Market Law does not list these extraordinary conditions. The president has not used this power to close the exchange to this date.

As of January 1993, there are 120 registered members in the Istanbul Stock Exchange. The Capital Market Board is planning to pass a regulation that controls the activities of the members. Trading hours are 9:30 A.M. to 12:30 P.M. daily.

2.D. LISTING

Article nine of the regulations of the Istanbul Stock Exchange states several requirements for listing,

A. For securities representing partnership rights:

1) Application

a) Must refer to the entirety of the series issued until the application date if the securities are to be listed for the first time.

b) Must refer to the completion of the existing series previously listed on the Exchange.

2) Of the partnership holding securities to be listed

a) The number of shareholders must be over 100 and at least 15 percent of the paid in capital must have been publicly offered.

b) The corporation's financial position must be determined and approved by the Exchange Administration to be at a level to enable the establishment to carry out its activities soundly.

c) The corporation must have experienced at least two consecutive profitable years.

d) The aggregate amount of the paid in capital must be at least TL 500 million.

e) The security must conform to the pre-determined criteria of the Exchange Administration in terms of current and potential transaction volumes in the market. Provisions concerning banks and other organizations are reserved. However, in the case of capital increases through rights and bonus issues, the method of implementation shall be determined by the Executive Council of the Exchange.

B. For securities representing indebtedness:

1) The application must refer to the entirety of the series.

2) The nominal value of the issue related to the specific application must be at least TL 500 million.

3) For the partnership with securities to be listed

a) At least three years must have elapsed since the incorporation date. If at least 25 percent of the capital is held by more than 100 shareholders, this obligation is reduced to 2 years.

b) Its financial leverage must be approved by the Exchange Administration to be at a level to enable the establishment to carry out its activities soundly.

c) The corporation must have experienced two consecutive profitable years.

d) The aggregate amount of the paid in capital must be at least TL 500 million.

e) The security must conform to the pre-determined criteria by the Exchange Administration in terms of current and potential transaction volumes in the market.

With the exception of partnerships and participations, those securities issued by the state economic enterprises, the administrations of the "general annexed budgets", and local administrations are listed on the exchange upon the written approval from the Ministry related to the Treasury and Foreign Trade Undersecretariat while securities issued by the investment partnerships are listed on the exchange upon written approval by the Capital Market Board.

Listing fees consist of admission and extension fees. An admission fee is paid within 7 days following the acceptance notice to list. For securities representing partnership rights, listing fees are fixed according to the nominal value of the securities at one time only, whereas fees for securities representing indebtedness are based on the aggregate nominal value of the securities calculated according to the tariff determined by the Executive Council.

Extension fees are paid annually after the first year as long as the securities remain on the Exchange List. The extension fee is approximately one fifth of the listing fee. For securities representing partnership rights, extension fees are based on the aggregate nominal value as of the end of the preceding December. Extension fees can be paid until the end of January of the subsequent year. For the securities representing indebtedness, extension fees are based on the balance of each series as of the end of the preceding December and are paid within 7 working days following the notification of the assessment sheet. The listing fees are the following:

For the first TL 250 million	0.1%
For the next TL 250 million	0.08%
For the next TL 500 million	0.06%
Above TL one billion	0.04%

2.E. DELISTING

Under the following conditions the listing committee may decide to delist a company:

1. The partnership ends or the company ceases production for a long period.
2. The company declares bankruptcy.
3. The company loses 2/3 of its capital.
4. The reports of the last two years do not show any profit.
5. Delisting is beneficial for the public.
6. The company does not provide the reports required by the exchange.
7. The market value of the security falls far below the face value of the security.

8. The volume of the transactions falls below certain value.
9. It is established that the company gave different reports to different exchanges.
10. The company keeps paying dividends without having profits.

2.F. DIFFERENT MARKETS WITHIN THE EXCHANGE

Initially, three markets were established for the stocks in the exchange:

1. The senior market or first market for blue chips
2. The junior market or second market
3. The unlisted market.

The most liquid stocks were traded on the senior market. Stocks on the second market were not traded every day. Stocks that were not listed on either the senior market or on the junior market were traded on the unlisted market. The Istanbul Stock Exchange provided different rooms and different hours for each of these markets. On June 11, 1990, the exchange merged the senior market with the junior market and installed boards for all companies.

For bonds there are two markets:

1) the regular market, and 2) the unlisted market. Corporate bonds are bought and sold in the regular market. Government bonds, treasury bills and revenue sharing certificates are not listed and are transacted on the unlisted market. Of the securities unlisted on the exchange,

the ones satisfying the requirements specified in the Circular of the Executive Council are transacted by the approval of the same authority. Corporations not meeting the standard requirements over time or refusing to provide relevant information to the exchange are discharged from the unlisted market by the decision of the Executive Council. Admission to the related market is determined by the Executive Council upon the application of the issuing corporation or the exchange member holding a minimal number of the subject security.

Revenue sharing certificates (traded on the Istanbul Stock Exchange) are a unique characteristic of the Turkish financial system. Revenue sharing certificates promise to pay certain percentage of the profit of the underlying project within the maturity of the certificate. As an investment instrument, revenue sharing certificates are similar to bonds. Instead of fixed coupon payments investors receive revenue sharing certificate payments for profitable years. On December 1, 1984 Turkish government issued the first revenue sharing certificates in order to obtain financing for government projects. According to Decree No 2983, which was passed on February 29, 1984, the government can issue revenue sharing certificates of the following state owned projects: bridge, dam, railways, highways, telecommunication systems, airports, and state economic enterprises. The first revenue sharing certificates were issued for the First Bosphorous Bridge. The first issues were sold in one day. Investors waited hours in line to buy the certificates. These certificates are still very popular among small investors. Transaction volumes for the different markets of Istanbul Stock Exchange is given by the following tables. Bond transactions represent 95% of the market volume. In 1987 the capital market board changed the rules of listing on the senior market. These less restrictive requirements induced many companies that were initially listed on the junior market switch to senior market.

2.G. SALES

Sales are made by lots. One lot contains either 50 or 100 stock certificates. Shares for which the last clearing price

TABLE 2.5
TRANSACTION VOLUME IN ISTANBUL STOCK EXCHANGE
(TL MILLION)

STOCK CERTIFICATES

YEAR	SENIOR MARKET	JUNIOR MARKET	UNLISTED MARKET
1986	7167	14833	52.5
1987	99357	3973	2046
1988	144556	3562	826
1989	1714038	12663	1803

TABLE 2.6
TRANSACTION VOLUME IN ISTANBUL STOCK EXCHANGE
(TL MILLION)

BONDS

YEAR	CORP.BONDS	REV. CERTIFICATES	TREASURY BONDS
1986	84218	59932	965821
1987	559384	401215	3795370
1988	1266909	430416	9758661
1989	2701143	2222920	29566248

TABLE 2.7
PERCENTAGE OF DIFFERENT MARKETS IN THE VOLUME

YEAR	STOCK CERTIFICATES	BONDS
1986	1.95%	98.05%
1987	2.17%	97.83%
1988	1.28%	98.72%
1989	4.77%	95.23%

Source: *Sermaye piyasasi menkul kiymetler ve portfoy analizi* by Mehmet Bolak, 1991, Istanbul

is TL 10,000 or less are traded in multiples of 100 units. Stocks that have prices TL 10,000 and above are traded in multiples of 50 units.

The following sales are called " special sales" according to Article 13:

1. Block Sales: Sales with a dollar amount of more than 10 percent of a company's capital are called block sales. If such an order is submitted prior to the opening of a session, the exchange specialist notifies the Chairman of the issue before announcing the start of the session. If an order for the block sale or purchase of a security is presented during a session, the exchange specialist distinguishes this order from the others, and informs the chairman of the order. In both the aforementioned cases, the chairman organizes one or more special sessions, within three days following the submission of the order, to enable the execution of the transaction. Information on the location and maximum number

of sessions that could be allocated for block transactions are announced in the exchange. Exchange officials make sure that all interested parties have information about the block sale and can participate if they choose.

2. Official Auctions: Transactions of securities that are required to be executed at the exchange by enforcement offices and other government departments are processed according to special rules.[4]

3. Transactions in Primary Market Issues: Sales transactions by public offering of securities classified as primary market issues and sanctioned by the Executive Council are conducted according to the following procedures. Issuing partnerships, or underwriters, or banks acting as the bidders apply to the Exchange Administration in written form and supplement the Capital Market Board's permission for public offering. If the Exchange Administration approves of the application, the applicant is notified of the location and time of the sale. This information is announced in the exchange and the bulletin at least a week in advance of the transaction.

2.H. TRADING SYSTEM

The trading system on the Istanbul Stock Exchange had been a call market until November 17,1987. Initially an opening price system was used. In this system, customers

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[4] Article 45 of the Istanbul Stock Exchange Regulations refers to the procedures of official auctions.

give written orders to experts working on the exchange. The experts then implement the transaction. The experts choose the opening price of a stock in such a way that the largest volume of trading is possible. The system has the following disadvantages:

1. The largest transaction volume occurs in the opening session and volume of the following sessions decreases dramatically.

2. Because opening orders are made and evaluated at the same time, the time priority principle loses its importance.

3. If supply and demand are not equal at the opening price, then in the absence of time priority the experts must decide on the particular orders to be satisfied. The Istanbul Stock Exchange accepted a proportionality principle. For instance, if 5,000 shares are supplied and 10,000 shares are demanded with opening price then each customer gets one half of his demand without discrimination.

4. The Exchange works very slowly because this system requires written orders.

5. Since experts choose the opening price, the public does not really know how price is determined.

After one year, the volume on the Istanbul Stock Exchange increased very rapidly and this system turned out to be inadequate. On November 16, 1987, the call system was abandoned. Since that date, the continuous auction system with board trading has been used. Exchange members write both buying and selling orders on each security's board. When a buying order is matched with a selling order the transaction is executed. The multiple price method is utilized in trading securities. According to Article 25 of the Istanbul Stock Exchange regulations, orders are submitted in the following way:

1) Orders for round lots: These are orders issued in transaction units. The total amount of regular orders and/or consecutive orders entered on the panel or computer screen by the members cannot exceed the quantity determined by the Executive Council. If another order is recorded after the order of the initial member, the initial member may again enter a new order. A member may cancel or change the price of an order while holding the volume constant as long as the order is not matched wholly or partially. A member may cancel an order if another order is not recorded after his order.

2) Orders for odd lots: These are orders issued for a number of shares (nominal value/1000) less than the unit of transaction. They are expressed as the number of shares.

3) Special orders: Founders' shares and preferred shares are entered as special orders. A special order may only be traded in its entirety. In order for a special order to gain time priority, its price and quantity must be equal to those of other such orders since each order is a single entity due to its indivisibility. A better priced order with an unequal

size compared to that of the others does not hold priority. A member may prefer and choose an order based on its quantity over an order featuring a better price. A member who has written an order may cancel the order before the transaction is executed.

When a deal has been consummated, the parties copy the price and the amount of the transaction and then give the copies to an exchange officer. The exchange takes no direct part in this transaction.

In this system there is both time and price priority. According to Cohen (1986), " The board trading system is economical to operate and is capable of accommodating at least moderate trading volume. The biggest disadvantage of the system is that it allows large price changes within one day and causes speculative gains."

In November 1987, the Istanbul Stock Exchange adopted the continuous auction trading system on the " Big Board" of the senior market, which had 50 companies. On June 11, 1990, the Istanbul Stock Exchange merged the junior and the senior markets and installed boards for virtually all traded companies. Work is also under way to partially automate and computerize the trading system in view of the unexpected growth in daily turnover.

All transactions are under the strict control of the Capital Markets Board. To prevent large price fluctuations, the exchange may suspend trading in a particular stock for a period. A General Assembly Meeting held in May 1990 resulted in a recommendation of a reduction in the daily price limit of ∓10 percent to ∓5 percent (within a day), but as of the end of July 1990 this rule had not been implemented.

2.I. SETTLING AND CLEARING

Settlement takes place within two days after the transaction. Until July 1989 all settlements were made on a cash basis, but the exchange replaced cash payments with bank transfers. Until October 1988, stocks in the Istanbul Stock Exchange were manually delivered from one broker to the other one. Later on, securities were delivered to the clearing house. Securities that are sold are submitted to the Settlement Center-Clearing Office. The buyer then submits the money or the bank order to the Center to receive the securities. The Settlement Center-Clearing Office works with daily net settlement principle.

2.J. INVESTMENT PARTNERSHIPS AND INVESTMENT MUTUAL FUNDS

According to the Capital Market Law, individuals wanting to form collective investment institutions can form two kinds of companies.

1. Investment partnerships

Small investors can combine their capital and form a company. This company then forms diversified portfolios and distributes the profits at the end of each year to the stockholders. In Turkey there are no investment partnerships or investment companies formed according to the Capital

Market Law. There are some investment holdings, but these holdings are different than the investment companies. The holdings invest in real estates, factories. Unlike investment companies they do not continuously change their portfolios and do active portfolio management.

According to Karsli (1991), investment partnerships will be beneficial for Turkish investors. He suggests that these companies be formed under a bank's supervision to increase the trust of Turkish investors. The biggest problem for these companies will be to find professional managers who can actively manage portfolios.

2. Investment mutual funds

Turkish Capital Market law allows only banks to form mutual funds. The founding bank first puts a deposit on the fund and issues fund certificates for participants. Banks withdraw their deposits when equivalent amounts of money are collected from investors. Some mutual funds distribute their end of the year profits and some do not. The law prohibits mutual funds from investing in companies 10 percent of capital of which belongs to the shareholders or managers of the fund. Mutual funds managers are prohibited from investing more than 20 percent of their capital in one company's stocks. Mutual funds are also prohibited from owning 10% or more of any corporation. Mutual funds earnings are exempt from corporate tax. The executive bank charges its marketing commission, executive salaries and expenses from the fund.

On July 20, 1988, the government passed a law regarding the formation of the Turkish Mutual Fund. The Turkish Mutual Fund was established in 1989 and registered on the New York Stock Exchange. Foreign investors can buy certificates of this fund and participate in the Istanbul Stock Exchange. According to Karsli (1991), the investment restrictions on mutual funds are preventing big banks from forming these funds. For example, if Akbank, one of the biggest banks in Turkey, decides to form a fund, it cannot invest in stocks of companies with a suffix SA, because Sabanci Holding owns the majority of the shares in both the bank and the companies. Yet if one wants to diversify efficiently in Turkey, stocks of Sabanci companies should be included in the portfolio (Karsli 1991).

For small investors, both investment partnerships and funds are very beneficial. The Istanbul Stock Exchange needs these institutional investors. Although the Capital Market Law passed in 1981, no bank formed an investment mutual fund until June 1987. In June 1987, the government passed a law permitting mutual fund profits to be tax exempt. Following that, the first investment mutual fund was established. Many funds followed the first one. The government decided to cancel the tax exempt status of the funds when stock brokers and brokerage houses complained about unfair treatment. In spite of this, the number of mutual funds continuously increased. Although the investment composition and the risk levels of the funds are different, Turkish investors think that these funds bring more or less same return and therefore they are very similar to bank deposits. This perception makes the investment funds very popular among Turkish investors .

2.K. SHORT SALES

The Capital Market Law indicates that short sales are illegal in Istanbul Stock Exchange. Recently it was discovered that the intermediaries who buy and sell a stock on the same day, continue to short sell that particular stock. In an effort to shed light on the restriction, the Board issued decree No. 153 indicating that short sales are illegal for everyone (including intermediaries) and under all circumstances.

Although short sales are illegal there are no specific penalties for the participants, and there is no authority to investigate the process. As a result, short sales are made on the exchange. The intermediaries most of the time buy and hold the stock certificates for customers. Sometimes they short sell these certificates without getting permission of the customers.

2.L. FOREIGN INVESTMENT

Decree No. 32, issued on August 11 1989, removed all restrictions on foreign investments. Now, Turkish investors

may buy or sell foreign securities, and foreign investors may buy securities listed on the Istanbul Stock Exchange. There are no restrictions on the patriation of the capital gains and dividends. Table 2.8 shows the amount of foreign investment in the Istanbul Stock Exchange. In 1990, foreign investment in the exchange was $ 252,452,000. As of August 1991 the amount of investment was $ 132,690,000. Comparing this number with $ 207,775,000 of August 1990, indicates that the amount of foreign investment decreased in year 1991. The high inflation in Turkey and the recent negative returns in the stock exchange have disappointed foreign investors.
Also foreign investors still do not trust the executives of the exchange. They suspect that they can lose their money in a very short time, because of government decisions and insider trading activities.[5]

2.M. TAXES

Up until 1980 the corporate tax rate was 25 percent. With a new decree on January 1 1987, a 46 percent corporate tax rate was implemented. Under the following conditions the Committee of Ministers can reduce the tax rate of the corporations according to a predetermined schedule:

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[5] According to Caner Ertuna (Vice President of capital market board) initially both the administration and the exchange executives were hopeful that foreign investors would invest heavily in the exchange. However, many investor groups that came to visit the exchange said the exchange is too risky. Some groups that invested in the market, later sold their shares.

1. If 80% of the securities are owned by investors.
2. If the company is listed on the exchange.
3. If the capital structure of the company is easily understood by examining the records.
4. If the company has more than 200 shareholders each with less than one percent share.

Under the above conditions if the share of 200 small investors are 25 percent of the total capital, then the tax rate falls to 40 percent. The tax schedule is given as follows:

Total Share of 200 small shareholders	Tax rate
25%- 50%	40%
51%-729%	35%
80% and above	30%

TABLE 2.8
PURCHASES AND SALES OF FOREIGN INVESTORS
(Thousand $)

	Purchases	Sales	Net
1990	252,452	164,825	87,627
1990/08	207,775	105,103	102,672
1991/08	132,690	38,507	94,183
1991/01	3,750	6,603	-2,853
1991/02	29,016	14,812	14,204
1991/03	32,625	1,003	31,622
1991/04	31,894	870	31,024
1991/05	6,984	1,808	5,176
1991/06	3,487	2,574	913
1991/07	14,688	7,844	6,844
1991/08	10,246	2,993	7,253

Source: *Sermaye Piyasasi Kurulu Yillik Rapor*, 1991, page 72

Dividend income on shares and interest income on government bonds are exempt from income tax. Interest on corporate bonds are subject to 10 percent income tax. Capital gains from government bonds and revenue sharing certificates are exempt from corporate and income tax. Capital gains from listed securities are also tax exempt. Under these conditions investors pay taxes only on capital gains on unlisted securities.

2.N. COMPANY REPORTS

Capital Market Law requires companies to issue annual periodic reports (balance sheet, income statement) in addition to special reports that are necessary to inform the public. For example, a decision to issue bonds is a special case and requires a special report.

There is no board or committee which rules on accounting principles in Turkey. Karsli (1991), who is the first chairman of the Istanbul Stock Exchange, believes such a committee should be formed and every company listed on the exchange should use generally accepted accounting principles.[6]

2.O. INSIDER TRADING

The Capital Market Law prohibits insider trading. But the law does not specifically describe the activities that

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[6] In 1993 the Capital Market Board formed a new committee to work on generally accepted accounting principles of Turkey.

are classified as insider trading. There is no authority to investigate insider trading and there are no courts to prosecute insider traders.

2.P. PROBLEMS OF THE ISTANBUL STOCK EXCHANGE AND SUGGESTIONS FOR FURTHER DEVELOPMENT

The returns for Turkish stocks were very good in the first year of the operation. As a result, many small investors channeled their funds into the stock market. However, in later years as the rate of inflation continued to rise, returns on the stocks could not keep up with inflation rates, and other instruments (especially treasury bonds). As a result, small investors (who perceive stock market investment as short term), lost a lot of money by investing in stocks. Table 2.9 shows the trading volume, number of companies and average price earnings ratio for 6 years.

One problem facing the stock exchange is the absence of institutional and long term investors. Insurance companies and mutual funds do not invest in the stock market. In the absence of market makers, small investors and speculative trading of intermediaries cause large price fluctuations.

At the beginning of privatization, the committee that is in charge of the process decided on prices for securities administratively and made block sales periodically whenever the administration needed money. According to Caner Ertuna *Eregli Demir Celik* block sale caused large capital losses among many small investors. Their estimation of the price was high.

The biggest problem of the exchange is integrity. After being burned many times, small investors lost their trust in the executives of the exchange and to the whole process of investing in stocks.

Another problem is the intermediaries' activities. They advise, perform brokerage services and form their own mutual funds selling shares of the fund to shareholders. There is a conflict of interest here. Intermediaries also invest for their companies. The Capital Market Board reports that only 1/4 of the daily sales are real sales (sales between two distinct parties). Intermediaries buy and sell the same stock many times a day to receive speculative gains. The Capital Market Board cannot supervise these intermediaries properly. Although there are rules, there is no authority to enforce these rules and really supervise intermediaries.

TABLE 2.9
MAIN INDICATORS ABOUT THE ISTANBUL STOCK MARKET

YEAR	TRADING VOLUME (BILLION TL)	NO. OF COMPANIES	P/E RATIO (%)	INDEX (8601=100)
1986	247	348	5.1	170.9
1987	266	414	15.9	673.0
1988	253	556	5.0	373.9
1989	255	730	15.7	2217.7
1990	247	916	23.9	3255.7
1991	247	1092	15.9	4369.2
1992	228	1205	10.5	3786.2

Source: *Sermaye Piyasasi Kurulu Aylik Bulteni, Kasim 1992*

In Turkey, various sources report that managers of the listed companies continuously buy and sell their companies' shares. There are no laws preventing managers and owners from doing that. Insider trading should be controlled and speculative buying and selling by certain participants should be avoided in order to improve efficiency. The Istanbul Stock Exchange should pass certain laws requiring managers to report their transactions similar to those of the New York Stock Exchange.

The problem of the 1980s was the establishment of the stock exchange. Now that phase is over. In 1990s the treasury department, the Central Bank and the Capital Market Board should coordinate their activities and work together. The Capital Market Board should form new departments and establish new rules to supervise the activities of the intermediaries. Insider activities should be specified and authority should be given to certain departments of the Capital Market Board to monitor and investigate these activities. The auditing companies that monitor the companies should be chosen very carefully. Finally, educational publications and seminars should be provided to inform the public about the stock exchange and the investment process in general.

In the following chapter the distributional and statistical characteristics of security price changes are investigated and these distributions are compared with those of securities in exchanges of the developed countries.

CHAPTER 3

STATISTICAL AND DISTRIBUTIONAL PROPERTIES OF THE TURKISH STOCKS

In this chapter the distributional properties of daily and weekly price changes are investigated. First the first four moments of the distributions are described and then the following hypotheses are tested whether (1) a normal distribution or (2) a strict white noise process is appropriate for the series. It is shown that significant dependencies do not exist in either the original series or in the squared series for a majority of securities investigated. However, the absolute value series exhibit significant dependence.

A recent trend among developing countries is the removal of restrictions on both domestic investment of foreign investors and foreign investments of citizens of their countries. Decree No. 32 (passed on August 11, 1989) removes all restrictions on overseas institutions and individuals on investment in securities listed on the Istanbul Stock Exchange. This decree supersedes and clarifies the government decree enacted in July 1988 that restricted foreign institutional investors' access to the equities market to mutual funds, subject to prior approval from the Treasury Department. Decree No. 32 allows Turks to buy foreign securities while foreigners can buy Turkish securities listed on the Istanbul Stock Exchange. The stock and bond markets are now open to foreign investors with guaranteed repatriation of any profits. How does this decree affect domestic and foreign investors? Will there be long term changes in the structure of price changes?

In the second part of the chapter the effect of the Turkish liberalization process on the equity market is examined. The Turkish government allowed foreign investors to participate in the Istanbul Stock Exchange transactions beginning from August 11, 1989 as a part of ongoing economic and financial liberalization process. The daily price changes before and after this date are compared and it is shown that this decision did not affect the mean of price changes significantly. However, this administrative action cause significant changes in variance. The series are nonnormal both before and after August 11, 1989. The stock distributions exhibit not linear dependence, but nonlinear dependence in both periods.

The chapter starts with the discussion of studies investigating distributional properties of U.S and international stocks. Then some theoretical models regarding internationalization of stock markets and empirical studies about them are investigated.

In section A the literature that examines daily and weekly stock returns is reviewed. In section B the data, the period and the sample used, the test statistics we utilize in description and in testing the hypotheses are introduced. In section C the results of the daily and weekly data are provided and the results are discussed. In section D the results of pre and post August 11, 1989 data are presented and compared.

3.A. LITERATURE REVIEW

1. Studies about random walk and various different price distributions

Research on the distribution of speculative prices starts with the work of Bachelier (1900). Bachelier (1900) assumes that successive price changes have independent and identical normal distribution. Based on these assumptions, he contends that increments in the price process are stationary in the mean and uncorrelated, and that price changes therefore, follow the random walk model.

Mandelbrot (1963) observes that the price distributions can not be represented with normal functions and that the central limit theorem does not hold. He suggests that the prices follow a stable Paretian distribution rather than a normal distribution. Stable Paretian distributions have four parameters: 1) location parameter; 2) scale parameter; 3) index of skewness; and 4) measure of height of the extreme tail areas. The characteristic exponent α takes the values between zero and two. If α of a stable Paretian distribution is equal to two then the distribution is normal. A stable Paretian distribution with α values less than two has longer tails than a normal distribution and also has an infinite variance.

Fama (1965a) studies the distribution of U.S. stock prices. He tests the following two assumptions in stock price series: 1) that successive price changes in a security are independent; and 2) that the price changes follow some probability distribution. Fama tests both assumptions using data on thirty stocks included in the Dow Jones Industrial Average. He uses a serial correlation model, runs analysis, and Alexander's (1961) filter technique to check for independence. Fama reports an extremely small amount of dependence for all stocks, and therefore concludes that the independence assumption is valid.

Both Fama (1965a) and Mandelbrot (1963) find that price changes or returns exhibit extreme leptokurtosis and skewness. Fama states " ... the empirical distributions are more peaked in the center and have longer tails than the normal distribution."

Fama (1963) applies Mandelbrot's techniques to stock prices and finds that departures from normality are in the direction of the Mandelbrot model. He then proceeds to estimate α. The general result of the different methodologies employed indicate that α is between 1.90 and 2.00, but not exactly 2.00. Fama concludes, "... the stable Paretian distribution with characteristic exponent α less than two seems to fit the data better than the normal distribution."

After Fama's and Mandelbrot's studies various researchers try to find a distribution that fits the stock data, accepting the hypothesis that price changes are independently and identically distributed and removing the normality assumption.

Both the Student t and the stable distributions can be derived as continuous mixtures of a normal distribution. The variance of the normal distribution is considered a random variable. When the reciprocal of the variance follows a gamma-2 distribution, then the unconditional distribution of returns follows a Student t distribution. On the other hand, when the variance follows a strictly positive stable distribution with α less than one, then the unconditional distribution is symmetric stable with α less than two.

Blattberg and Gonedes (1974) compare the symmetric stable and Student t distributions. The Student t density functions have three parameters: location parameter, scale parameter, and degrees of freedom parameter d. The Student t distribution, with $d > 2$ can be compared to the unit normal distribution in the following way: 1) it has fatter tails than the unit normal distribution and 2) it has a higher mean than the unit normal distribution. As degrees of freedom of t distribution approaches infinity the t distribution approaches the unit normal distribution. The Student t distribution explains the fatter tails observed empirically just as the stable distribution does.

Stability property differentiates the stable and the Student t distribution. Stability means that for n identically and independently distributed random variables, the distribution of their sum differs from the distribution of each random variable only by location and scale parameters. The Student t distribution is not stable. For degrees of freedom greater than 2, the distribution of sums of independently and identically distributed random variables of the Student t distribution approach to a normal distribution. A normal distribution is a special case of stable distribution with α is equal to 2. The stable distribution, on the other hand, is stable under addition. If a series follows a stable distribution so does the sum of the series. However sum of a Student t distribution does not follow a Student t distribution. Blattberg and Gonedes (1974) use stability condition to differentiate between two distributions. They first investigate simulated Student t distribution and stable distributions then compare the actual return data with the simulated results. The authors check two criteria for determining the most appropriate distribution. They compare 1) the likelihood ratios and 2) the distributions under addition. They find that, as the sample size increases, the Student t distribution approaches the normal distribution. Unlike the stable distribution, therefore, the Student t distribution is not stable under addition. Blattberg and Gonedes use the same data as Fama's

(1963) model and their data seem to converge to normality. Blattberg and Gonedes conclude that the Student distribution fits the data better than the stable distribution does.

Clark (1973) proposes the subordinate stochastic process as an alternative to the stable distribution. He calls a special case of the subordinate distribution a lognormal-normal distribution when the independent increments $\Delta X(t)$ are normally distributed, directed by a process T (t) whose independent increments are lognormally distributed. He then proceeds to compare the lognormal-normal distribution with the stable distribution using Kolmogorov Smirnov's goodness of fit tests. He concludes that the lognormal-normal model describes the data better than the stable model.

Various researchers investigate the stable law hypothesis as probability models of stock prices. Initially researchers used the fractile method of Fama and Roll (1971) to estimate parameters of stable distributions. Their method assumes β (measure of skewness) is equal to zero, therefore the distribution is symmetric. Later McCulloch (1986) generalize this method for β values between -1 and 1. Koutrouvelis (1980) suggests a regression method that starts with an initial estimate of parameters and proceeds iteratively until some prespecified convergence criterion is satisfied.

Blattberg and Gonedes (1974), Hsu, Miller and Wichern (1974), and Officer (1972) report evidence against the hypothesis that stock returns are stable. Simkowitz and Beedles (1980) show that stock returns are highly skewed and stable distributions do not fit. They conclude, " ... past efforts to measure the characteristic exponents of security return distributions should be questioned. The present evidence is consistent with the notion that returns might well be mixtures of distributions. This mixture would not strongly demonstrate stability since it would be a mixture of distribution of different αs."

Akgiray and Booth (1988) examine the tails of the return distributions instead of testing the overall fit of stable distributions in an effort to validate the stable distributions. They find that the empirical stock distributions have thicker than normal but thinner than stable tails. They conclude, therefore, that inferences made based on the assumption of stable distributions may be inappropriate and wrong.

Recently, Lau, Lau and Wingender (1990) offer a procedure for determining whether a large sample comes from a stable population against the alternative that it comes from a population with finite higher moments. A stable population sample has moments of the fourth and sixth order whose magnitudes increase very rapidly as the sample size increases. They create 5000 simulated observations for normal, lognormal and stable distributions (with different α and γ values). The authors compute the fourth and sixth order sample moments for 100 samples and list the mean, standard deviation, the highest and the three lowest observations of the 100 b_2 and b_4 values. Then they randomly select 100 firms from the CRSP files and calculate the means, the standard deviations and three highest observations of their b_2 and b_4s. Their empirical results are much smaller than the corresponding figures of stable distributions. Their conclusion is that these returns as a group do not come from stable populations with $\alpha < 1.9$. As far as individual stocks concerned the stable population hypothesis can be rejected for more than 95% of the stocks. Their results indicate two other points: 1) Applying a stable fitting procedure to samples from finite moment populations can produce low α values, and 2) lower α values are obtained with samples from finite moment populations of higher β_2. Their results explain why researchers find low values of α, indicating stable distributions, while the actual distribution is not a stable distribution.

Akgiray and Booth (1986) find significant discontinuities in the sample path of the stock prices." The inability of Gaussian and other diffusion processes to describe price volatility is not surprising. This inability is because, in an efficient dynamic stock market, it is quite possible for prices to change by significant amounts in a very short time, but the probability of such jumps is approximately zero in diffusion processes. Therefore, stochastic processes with discontinuous time paths appear to be more appropriate for stock prices." Akgiray and Booth propose the superposition of a diffusion process and a compound jump process. They examine the case, which has Brownian motion, as the diffusion process and Poisson distribution as the jump process. The mixed diffusion jump process fit the data better than the pure diffusion process.

How does the mixed diffusion jump process compare with the discrete mixtures of normal distributions? Kon (1984) compares the mixture of normal distributions with that of student t on daily stock data. The former proves to be better than the latter.

Oldfield, Rogalski and Jarrow (1977) develop an autoregressive jump process for stock returns. This model is a mixture of a diffusion process and an autocorrelated jump process that has a gamma distribution. The authors examine transaction data of twenty NYSE stocks. They hypothesize that stock returns follow autoregressive jump process. The test results fail to reject the null hypothesis. After that they compare gamma and exponential distributions as appropriate process for autoregressive jump process. Gamma distribution gives a better fit to the data compared to exponential distribution.

Akgiray and Booth (1987) compare the mixed diffusion jump process with compound normal distribution. Once again, the mixed diffusion jump process outperforms the mixtures of the normal distributions for daily and weekly return series. The normal distribution fits most monthly series as well as either type of mixture distribution.

All of the studies discussed above are based on the assumptions that the changes in stock prices are uncorrelated over time and can be described by a distribution with fatter tails than normal. If the underlying distribution is normal, then serial uncorrelatedness implies that the price changes are independent. However, the general conclusion in the literature is that the distribution of speculative prices is not normal.

2. Studies about nonlinear dependencies in price changes

Press (1968) and Clark (1973) report evidence that the unconditional variances are nonstationary. Neftci (1984) conclude that there are no theoretical reasons for assuming either the linearity or the independence of price changes. Poterba and Summers (1988), Perry (1982) and Pindyck (1984) show that the linearity assumption and the assumption of the constant conditional means and variances are wrong. More recent studies by Bollerslev (1987), and Akgiray (1989) all conclude that the independence assumption of successive price changes is incorrect and models that incorporate nonlinear dependence are needed for stock prices.

It is a well established fact that the changes of speculative prices show nonlinearities and intertemporal dependencies. Engle (1982) starts modeling the time variation in the second moment. According to his model the conditional variance of the distribution depends on the lagged error squares. This model, which describes the conditional distribution as a normal function, is called the linear autoregressive conditional heteroskedasticity ARCH model. The parameters of the ARCH model can be estimated using the maximum likelihood method. The ARCH model allows for fatter tails than the normal distribution and also allows for volatility clustering.

Bollerslev (1986) generalizes the ARCH model and proposes a new model : the generalized ARCH or GARCH. In this model, conditional variances not only depend on the past values of the squared errors, but also on past conditional variances. This model is more parsimonious than the ARCH model.

Akgiray (1989) provides a comprehensive study of the distributional and time series properties of the U.S stock index returns to investigate whether the white noise, random walk, or linear process hypotheses best describe the distribution of stock returns. He finds heavy tails and sharp peaks consistent with prior research. His Kolmogorov-Smirnov and skewness tests reject the normality hypothesis. He also rejects the strict white noise hypothesis. The squared residuals show significant autocorrelation, indicating the presence of nonlinear dependency. The log-likelihood values of GARCH (1,1) model are greater than those of the ARCH (2) model for these data, showing that the GARCH model is a better fit to the data compared to the ARCH model.

Hsieh (1991) finds strong evidence to reject the hypothesis that stock returns are identically and independently distributed. He concludes that the cause of deviation is neither regime changes nor chaotic dynamics, but rather is conditional heteroskedasticity. The author applies ARCH type models to the stock returns and concludes that these models do not fully capture the nonlinearity in stock returns. He suggests a more flexible model of heteroskedasticity which seems to better explain the nonlinearity in the data.

The recent studies of U.S. stock prices all find nonlinear dependence in the series (Akgiray (1989), Hsieh (1991)). Multiplicative heteroskedasticity models seem to fit data better than any other models.

3. Studies about non-U.S. stock markets

Table 3.1 exhibits the studies for each particular market. Beginning in the early 1970s various European stock markets are investigated (Brealey (1970), Solnik (1973)) to determine the representative statistical return distributions. In the late 1980s the researchers explore different anomalies (January effect, size effect..) in both developed and developing stock markets. In the following paragraphs we first review the studies investigating time series studies, then those examining size anomalies and market models in individual markets.

TABLE 3.1
LIST OF STUDIES FOR NON-U.S. MARKETS

STUDY	COUNTRY
Solnik (1973)	France, U.K., Germany, Italy, the Netherlands, Belgium, Switzerland Sweden
Gultekin and Gultekin (1983)	Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Singapore, Spain, Sweden, Switzerland, U.K, U.S.A.
Koutmos (1992)	Belgium, Canada, France, Germany, Great Britain, Italy, Japan, the Netherlands, and Switzerland.
Sewell, Stansell, Lee and Pan (1993)	Hong Kong, Korea, Singapore, Taiwan, Japan, U.S.
Heinkel and Kraus (1987)	Canada
Praetz and Wilson (1980)	Australia
Brealey (1970), Poon and Taylor (1992) Lewis(1989) Linmack and Ward (1990)	Britain
Akgiray, Booth and Loistl (1989a, 1989b, 1989c) Sauer and Murphy (1992) Booth, Hatem and Mustafa (1990)	Germany
Solnik and Bousquet (1990)	France
Amihud, Mendelson, and Murgia(1990) Barone (1990)	Italy

(table con'd)

TABLE 3.1
LIST OF STUDIES FOR NON-U.S. MARKETS

STUDY	COUNTRY
Rubio (1988), Alonso, Rubio and Tusell (1990) Alonso and Rubio (1990)	Spain
Berglund, Wahlroos and Ornmark (1983) Wahlroos and Berglund (1986) Berglund and Liljeblom (1988) Berglund, Liljeblom and Loflund (1989) Booth, et al. (1992)	Finland
Frennberg, Hansson (1993)	Sweden
De Jong, Kemna, Kloek (1992)	Netherlands
Hawawini and Michel (1982)	Belgium
Alexakis and Petrakis (1991)	Greece
Kato and Schalheim (1985) Jaffe and Westerfield (1985) Barclay, Litzenberger and Warner (1990)	Japan
Bark (1991)	Korea
Aggarwal and Rivoli (1989)	Hong Kong, Malaysia, Philippines, Singapore
Laurence (1986)	Malaysia, Singapore
Wong and Lye (1990)	Singapore
Butler and Malaikah (1992)	Saudi Arabia, Kuwait

Solnik (1973) investigates 234 securities from eight major European stock markets to ascertain whether the stock prices follow a random walk process. The daily price changes of the markets (France, U.K., Germany, Italy, the Netherlands, Belgium, Switzerland and Sweden) all exhibit flatter distributions than that of U.S. markets, while the normal distribution would predict a bell shaped distribution. Also the distributions have fatter tails than the normal distribution. The deviation from normal becomes less significant for longer time intervals. When compared to the U.S. market, the deviations from the random walk are more pronounced in the European stock price behavior.

Gultekin and Gultekin (1983) examine the stock market seasonality in the following markets: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Singapore, Spain, Sweden, Switzerland, U.K, U.S.A. They use monthly index returns and report the descriptive statistics. Most autocorrelations are not significantly different from zero. High positive skewness in several countries is caused by extremely large outliers. Many return series deviate from a normal distribution. Their test statistics reject the null hypothesis that stock returns are time invariant. This seasonality is primarily caused by large returns in January. Their findings support a tax induced January effect in most countries except Australia.

Koutmos (1992) examines nonlinear dependencies in the weekly stock index returns of the following countries: Belgium, Canada, France, Germany, Great Britain, Italy, Japan, the Netherlands, and Switzerland. All of the indexes exhibit negative skewness and high leptokurtosis. The author rejects both normality and homoskedasticity hypotheses for all indexes. The preliminary results indicate that strong nonlinear dependence exist in all of the ten indexes. Koutmos utilize the exponential GARCH in the mean model to test for the existence of a positive risk-return tradeoff between the conditional mean and the conditional variance. The results indicate that the risk premium is negative and insignificant for all of the countries except Japan. The evidence suggests that current information can be used to predict future returns for Australia, Belgium, Canada, and France. The conditional variance of all the indexes are significantly related to past variances and residuals.

Sewell, Stansell, Lee and Pan (1993) examine the weekly indices of four emerging Asian markets (Hong Kong, Korea, Singapore and Taiwan), the Japanese stock market and the United States stock market. To detect nonlinear dependence the authors use the BDS test. The BDS statistics reject independent and identical distribution hypothesis both in period 1980-1989 and in 1983-1987 for all the emerging markets. This result is consistent with the notion that returns are generated by nonlinear stochastic systems. The authors fit a GARCH (1,1) model to the data and find that this model appears to capture the nonlinear dependencies in all series.

Heinkel and Kraus (1987) investigate the profitability of insider trading in Vancouver Stock Exchange. The authors identify particular profitable insider traders. However on average they fail to find superior insider performance. They conclude that the insiders do not, over all their trades, outperform the outsiders.

Praetz and Wilson (1980) study the distributions of monthly returns on the Melbourne Stock Exchange over 1958-1973. Stable Paretian distributions do not represent Australian stock returns. Their results indicate that Student t distributions provide a better fit to the data.

Brealey (1970) examines the distribution of rates of return from the British equity market. At first glance the distribution of daily rates of return from the British market resembles the bell shaped pattern of the normal distribution. The distribution is symmetric, but the series have longer tails than normal distribution. The author suggests that the distribution may be nonstationary.

Poon and Taylor (1992) use daily, weekly, fortnightly and monthly returns on the London's Financial Times All Share Index and show that the first three series are negatively skewed whereas the fourth one is positively skewed. All the kurtosis values are very much larger than 3. The autocorrelation coefficients for squared and absolute returns have more significant values than those of original returns.

Akgiray, Booth and Loistl (1989a) compare the distributional characteristics of weekly German and American indexes. For the German index, the empirical distributions appear to be normal. The American index exhibits negative skewness and leptokurtosis. Both returns are not serially correlated. Time dependency, as detected by autocorrelations in the absolute and squared value of the returns is present for both indexes. The authors then model the German index using the stable laws, the compound normal distribution and the mixed diffusion jump process. In terms of explanatory power, the last model appears to be superior to the other processes.

Akgiray, Booth and Loistl (1989b) examine the tail shape of the return distributions for 50 German stocks. The tails of daily and weekly distributions for German stocks are substantially different from what sample estimates of infinite variance stable models. The authors suggest future research to be concentrated on finite variance distributions.

Akgiray, Booth and Loistl (1989c) investigate the behavior of German stocks before, during and after the October 1987 market crash. In all three periods, the mean and skewness are not significantly different from zero. The Kolmogorov-Smirnov test for normality shows that the return distributions are nonnormal both during and after the crash period. Little dependence is present in the return series in any period. Higher order dependence is present in all periods. The authors then model returns with GARCH models. The GARCH (1,1) model provides good fit to the data for the pre and post crash periods. However the model is not adequate during the crash period. The authors conclude that the October 1987 crash temporarily changed the way in which German stock returns are generated.

Booth, Hatem, and Mustafa (1990) study the nonlinear dynamics of German stock returns. The authors use DAX index as a proxy for the German stocks. The DAX index returns exhibit both linear and nonlinear dependence. They eliminate the linear dependence and find that nonlinear dependence still exists. Their conclusion is that the observed nonlinear dependence is not generated by deterministic chaos, but can be modeled using an autoregressive conditional heteroskedastic framework.

Barone (1990) examines the efficiency of the Italian stock market using four different definitions of efficiency (information, valuation, full-insurance and functional). According to his literature review previous studies of Italian stock market find that stock prices are significantly correlated with lagged prices. The author compares the size and the number of securities listed in the Italian stock market with those of the other European countries and concludes that the market is inefficient in terms of completeness. Barone investigates calendar anomalies in the Milan stock exchange for the period 1975-1989. He finds the following results: 1. The Monday rates of change are significantly different from those of the other days of the week. The means of both Monday and Tuesday returns are negative. The means of the rest of the weekdays are positive. 2. The standard deviation of the Monday rates of change is larger than those of the other days. 3. On average, the rate of change on the days preceding a public holiday is higher than that for the other trading days. 4. There is a turn-of-the month effect. On the last day of the month and the three following days the changes in stock prices are markedly positive. On the basis of the sample obtained by excluding the observations corresponding to the first day of each month and to the trading days after a public holiday, stock prices are found to fall in the first part of the month and then rise in the second part. The daily stock price changes during the month of January is significantly positive. In conclusion, the Italian stock market exhibits many calendar anomalies.

Another international study with GARCH models is the stochastic modeling of Finnish stock returns. Booth, et al. (1992) document the presence of linear and nonlinear dependencies of Finnish stock returns. The data cover the period from January 1980 to September 1987. The Helsinki Price Index is value weighted and consists of 134 stocks. The unconditional return distribution is nonnormal, thick tailed and skewed. The authors then model the distribution of the Finnish stock index returns with GARCH models. The most appropriate model for the series appears to be the GARCH model with power exponential conditional error distribution.

Frennberg and Hansson (1993) test the random walk hypothesis on value weighted Swedish market index. They use real monthly returns between 1919-1990. According to their results, Swedish stock returns are positively autocorrelated over short return horizons (one to twelve months) and negatively autocorrelated over longer horizons (five years and more). Based on variance ratio tests and autocorrelations, they reject the random walk hypothesis.

De Jong, Kemna and Kloek (1992) examine the daily distribution of 13 major Dutch stocks. They confirm that Dutch stock returns (similar to U.S. stock returns) have extreme kurtosis and therefore do not follow normal distribution. They reject the stationarity of beta of market model and the hypothesis that variance of returns is constant. The authors propose a market model with a GARCH(1,1)-t distribution and a time dependent beta for event studies. They use this model to investigate the weekend effect and confirm that a negative weekend effect exist in Dutch stock returns.

Laurence (1986) investigates the daily stock returns of the Kuala Lumpur and the Singapore stock market. According to his findings 31% and 79% stocks on the Kuala Lumpur and the Singapore exchanges, respectively, exhibit significant lag one autocorrelations. However, these deviations are not large enough to exploit profitably. Both markets have leptokurtic and distinctly nonnormal distributions.

Butler and Malaikah (1992) examine stock return distributions in two thinly traded stock markets: Kuwait and Saudi Arabia over the period 1985-1989. Thirteen of the 36 Kuwaiti stocks (34%) have statistically significant lag one autocorrelation coefficients. The Kuwaiti market is similar to other thinly traded markets in the proportion of individual stocks exhibiting significant autocorrelations. In contrast, all 35 Saudi stocks exhibit negative and statistically significant autocorrelations.

Lewis (1989) examines the size effect in London stock exchange. He documents that there is size effect in the British stock market. However this effect is neither the only anomaly nor independent from other firm characteristics. He argues that the dividend yield and P/E multiples are more important factors in return structure than the size effect.

Using 270 companies of the London stock exchange, Linmack and Ward (1990) examine the efficacy of the market model and the factor based model during the October 1987 crash. The period for analysis covers October 16 1987 to January 31 1988. Over the entire period stock prices fell by approximately 30%. Their results show that beta is a significant explanatory variable over the whole period. However, the significance of beta falls for subperiods. They hypothesize that an additional factor contributing to investors revaluation of security prices is a more pessimistic view of the prospects for the international trade. An extended version of the market model with variables of international dimension shows greater explanatory power than the simple market model. However, the authors are not certain whether the variables selected to represent the international trade dimension are correlated with other fundamental variables.

Sauer and Murphy (1992) compare the Capital Asset Pricing Model with Consumption Capital Asset Pricing Model using returns on 140 German stocks. They fail to reject the joint hypothesis that risk-return relationships in Germany are exactly as implied by the CAPM and conclude that the CAPM explains risk-return relationships in Germany significantly better than the CCAPM and that relative excess returns on assets are positively and significantly related to their CAPM betas.

Solnik and Bousquet (1990) examine the day of the week effect in the Paris Bourse. They use the daily index returns between January 1978 to December 1987. They find that mean return on French stocks is positive for everyday except Tuesday. The largest mean return is on Friday. The liquidation process takes one month in the French Bourse. Most of the liquidation take place on Thursday. When the authors adjust for the liquidation effect the mean returns on

Fridays are no longer unusually high, but the return on Tuesdays stay significantly negative. They reject the hypothesis that all mean returns are equal for each day of the week.

Amihud, Mendelson and Murgia (1990) study the impact of the stock market microstructure on return volatility in the Milan Stock Exchange. The stock market in Milan uses a trading system that incorporates both a call market and a continuous market. Generally, trading in major stocks starts with bilateral transactions in the continuous trading ring, then proceeds to the major transaction of the day in a call auction market,and again proceeds in the continuous trading ring until the close. The authors choose 12 stocks that are continuously and heavily traded to compare the behavior of stock returns under two systems. Their results indicate that the variance of the opening transaction is 10% greater than that of the following call transactions, and the variance of closing transaction is 7% lower than that of call transaction. Opening with a continuous transaction creates a consistently higher volatility of the opening transaction. On the other hand opening with a call auction does not cause the first transaction volatility to be higher than the volatility of the following transaction. The authors conclude that the call transaction provides a more effective value discovery mechanism at the opening of the trade day, and attracts large trading volume.

Rubio (1988) rejects mean-variance efficiency of the value weighted stock market index of Spanish stock market. He reports that the average market risk premium is positive, but significantly positive only in January. He also reports a size effect in Spanish market.

Alonso, Rubio and Tusell (1990) estimate the relative risk aversion coefficient for the Spanish stock market between 1965-1984. They use monthly data and obtain the return on a particular stock from the exchange on which the share had highest trading volume.[7] Their results indicate that the relative risk aversion coefficient is 3.88 between 1965 and 1984. Based on these results, they reject the logarithmic utility function and the assumption of time-invariant constant relative risk aversion in the Spanish market. They conclude that a power utility function with a risk aversion coefficient of 4 is appropriate for Spanish stock returns. Moreover, the size effect is partially eliminated when this kind of utility function is used.

Alonso and Rubio (1990) examine the overreaction in the Spanish equity market. The authors investigate the behavior of extreme winners and extreme losers throughout the years between 1967 and 1984. They find that loser portfolios of five stocks outperform the return implied by the zero beta CAPM by 7.9% twelve months after portfolio formation. Winner

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[7] Alonso, Rubio and Tusell (1990) obtain return data from three stock exchanges in Spain.

portfolios earn 16.6% less than the return suggested by zero beta CAPM. Twelve months after portfolio formation, losers win 24.5% more than winners indicating that overreaction hypothesis is appropriate for the Spanish equity market.

Berglund, Wahlroos and Ornmark (1983) examine daily returns for all stocks quoted on the Helsinki Stock Exchange between February 2, 1970 and December 31, 1981. The stock returns exhibit high leptokurtism. The authors find strong first order serial correlation in the data. Positive serial correlations exist over the first two-three trading days. After that between the third and the tenth days negative serial correlations occur. However the magnitude of the serial correlation coefficients are too small. They conclude that the costs related to continuous scanning of information are too high to be compensated by the small returns obtainable from optimal timing on the Helsinki Stock Exchange. Berglund and Liljeblom (1988) also report significant market serial correlations on the Helsinki Stock Exchange.

Wahlroos and Berglund (1986) examine size and calendar anomalies in the Helsinki Stock Exchange. They find a statistically highly significant small firm premium. Stock returns are also seasonal. The equally weighted market index contains a January premium of 3.2%, which is significantly positive on the .005 level.

Berglund, Liljeblom and Loflund (1989) investigate the properties of different beta measures computed on daily data for a thin security market (Helsinki Stock Exchange). They compare simple OLS betas with trade to trade betas. The results indicate that none of the corrections produce much improvement compared to OLS betas. The paper shows that when betas are computed the exclusive use of stock prices based on actual trades do not solve the problem of a thin trading bias in measured stability of these beta estimates. Their betas corrected for differences in trading frequency are statistically related for firm size.

Hawawini and Michel (1982) examine another thin market the Brussels Stock Market. They use monthly returns on 200 stocks and test the CAPM hypothesis. The authors conclude that on average, there exists a positive and linear relationship between the return on securities and their corresponding level of systematic risk. They fail to reject the hypothesis that pricing of common stocks of the Brussels Stock Exchange conforms to the CAPM.

Alexakis and Petrakis (1991) analyze the behavior of returns on Greek stocks. They hypothesize that the components which affect a small capital market are more related to the existence of alternative investment opportunities and to social and political conditions, and less to economic activity and the economic profits of companies. In politically and economically unstable countries, returns on real estate and gold investments are generally higher compared to returns on stocks. The authors use quarterly Athens Stock Index return data between 1975 and 1987 and conduct principal components analysis to determine major variables related to the fluctuations in the stock price index. Their results indicate that the alternative investment opportunities, together with the socio-political factors, affect the evolution of the share price index. Foreign competition seems to have by far the greatest explanatory power, followed by the socio-political factor and the domestic investment opportunities. These factors outweigh economic activity and companies' profits.

Kato and Schalheim (1985) find not only a January, but also a June effect in Japanese monthly returns. Jaffe and Westerfield (1985) also find January effect in Japanese stocks. They report that lowest mean returns for the Japanese stock market occur on Tuesdays.

Barclay, Litzenberger and Warner (1990) examine determinants of stock return variances using Japanese data. Until recently, the Tokyo Stock Exchange was open for half a normal trading day approximately three Saturdays per month. By examining the variance of stock returns over weekends with and without Saturday trading, they analyze the effects of trading on stock return variance, holding constant the normal flow of public information. When the Tokyo Exchange is open on Saturday, the weekend variance is 112 percent higher than when the exchange is closed. The weekly volume also increases, however the weekly variance is unaffected. The unchanged weekly variance does not support the hypothesis that variance is generated by irrational trading noise. The results are generally consistent with the rational trading models, in which private information revealed through trading causes variance.

The seasonal and the day of the week effects in Hong Kong, Malaysia, Singapore and Philippines stock markets are examined by Aggarwal and Rivoli (1989). Using daily data they find both January and the weekend effects exist in all markets. Bark (1991) tests the CAPM in Korean market. The author rejects the hypothesis that there is a positive trade-off between market risk and return, and therefore rejects the whole model for the Korean stock market.

Wong and Lye (1990) examine the relationship between firm size, earnings to price ratio and returns on securities of the Singapore Stock Exchange. They use the period 1975-1985, and partition the stocks into three groups on the basis of their E/P ratios. Then each of the three E/P groups is further divided into three subgroups according to firms' market value. They conduct generalized linear model tests by using the CAPM equations and portfolios of each subgroup. Their results indicate that large firm portfolios earn significantly lower returns than small firm portfolios. Similarly high E/P portfolios earn high abnormal returns compared to low E/P portfolios. In the Singapore Exchange there is a significant relationship between firm size and earnings yields and stock returns. The E/P effect is more significant than the size effect.

4. Studies about liberalization of stock markets

Table 3.2 summarizes all the studies investigating liberalization in different markets.

TABLE 3.2
LIST OF STUDIES FOR LIBERALIZATION

STUDY	COUNTRY
Black (1974) Stulz (1981) Eun and Janakiramanan (1986) Errunza and Losq (1989)	Theoretical studies
Errunza and Losq (1985)	Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand and Zimbabwe
Errunza, Losq, and Padmanabhan (1992)	Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand and Zimbabwe
Gultekin & Gultekin and Penati (1989)	Japan
Bonser-Neal, et al. (1990)	Australia, Brazil, France, Germany, Italy, Japan, Switzerland,Korea, Malaysia, Mexico, Taiwan, Thailand, U.S.
Fang (1991)	London
Hietala (1989) Booth, Chowdhury and Martikainen (1993)	Finland
Berstorm, Rydqvist and Sellin (1993)	Sweden

Black (1974) develops a capital market equilibrium when there are explicit barriers to international investment in the form of a tax on holdings of assets in one country by residents of another country. An investor must pay tax on the value of his holdings of foreign assets. This tax is expressed as a percent per year of the value of his holdings of any foreign asset. This tax represents different kinds of barriers to international investment. According to Black, the following kind of barriers can be studied with his model: the possibility of expropriation of foreign holdings, direct controls on the import or export of capital, reserve requirements on bank deposits and other assets held by foreigners, and restrictions on the fraction of a business that can be foreign owned, and also barriers created by the unfamiliarity that residents of one country have with other countries. He assumes that short sales are unlimited and that an investor with a short position pays a negative tax. Because of these short selling assumptions, in this model an increase in the level of taxes on international investment does not lead to isolation of national capital markets. As the tax on foreign investments gets higher, an investor takes short positions. Black's model predicts that the optimal risky portfolio contains long positions in domestic securities and short positions in foreign securities, and that the optimal portfolio for a taxable investor is not a mixture of national market portfolios.

Stulz (1981) proposes a model in which barriers to international investments are also in form of proportionate tax. The difference between his model and that of Black lies in short selling assumptions. Stultz's model assumes there is a cost associated with holding either long or short risky foreign securities. He also assumes that only domestic investors face barriers to international investment. Stulz ignores exchange rate risks and reports the following results: 1. In the presence of barriers to international investment, some risky foreign assets can be nontraded, in the sense that they are not held by domestic investors.
2. For investors who face barriers to international investment, the world market portfolio is inefficient in that there cannot exist a mutual fund for domestic investors which would make them indifferent between choosing an appropriate combination of the safe asset, the mutual fund, and the world market portfolio. He concludes that investors should be very careful in forming a portfolio of foreign stocks. Buying the market portfolio in a foreign country might be equivalent to buying a highly inefficient portfolio for domestic investors.

Errunza and Losq (1985) test the hypothesis of fully integrated international capital markets versus segmented markets using heavily traded securities from nine less developed countries (Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand and Zimbabwe) and a random sample of securities from the U.S. In order to investigate the results of segmentation they introduce one specific imperfection: the inability of a class of investors to trade in a subset of securities as a result of portfolio inflow restrictions imposed by some governments. Their model has the following assumptions: 1. Unequal access: the unrestricted investors can trade in all the securities available; the others can trade only in a subset of securities. 2. Perfect capital markets. 3. The utility of each investor can be represented as a function of the expected value and the variance of the returns. 4. Free lending and borrowing. 5. The returns are distributed normally. If markets are integrated then the risk adjusted average returns should be similar across national markets. Errunza and Losq's assumptions produce returns which are quite different from what one would anticipate under full integration. For less developed markets the ratio of realized to expected returns is higher than that for the U.S market, providing evidence of segmentation. The authors define a security as technically eligible if there are no formal capital controls on foreign portfolio investments. The securities of U.S., Thailand, Zimbabwe and open Mexican firms constitute the technically eligible segment. They conclude that mild segmentation does not affect required return on an eligible security whereas the required return on an ineligible security is different from what CAPM would suggest in the sense that the latter require a super risk premium.

In their latest study, Errunza, Losq and Padmanabhan (1992) test two polar cases 1. complete integration, 2. complete segmentation in addition to mild segmentation for 6 emerging markets with maximum likelihood estimation procedure. Following Errunza and Losq (1985), they allocate U.S. securities as the eligible segment and classify securities within each emerging market as a set of ineligible securities. In this paper each market constitutes a separate ineligible segment. In their previous work the authors choose to pool securities across the emerging markets, and classify the entire set as ineligible securities. They first list the type of portfolio flow restrictions that the following countries administer: Greece, Chile, Argentina, Brazil, Korea, Mexico, India and Zimbabwe. A priori the authors expect to find all the tested markets except Brazil and Mexico (which are expected to be more integrated) be mildly segmented. They compare each country with the U.S. stock market pairwise and report whether they are integrated with New York stock exchange. The complete integration hypothesis is rejected in all eight cases. Mild segmentation is rejected for only India. Complete segmentation can be rejected for Chile, Greece, India, Korea, Mexico and Brazil, whereas it cannot be rejected for Argentina and Zimbabwe. They conclude that while Brazil, Chile, Greece, Korea and

Mexico is mildly segmented, Argentina and Zimbabwe appear to lie on a continuum from mild segmentation to complete segmentation. For India all three models are rejected.

Eun and Janakiramanan (1986) list the restrictions imposed on foreign equity holdings in the following counties: Australia, Burma, Canada, Finland, France, India, Indonesia, Japan, South Korea, Malaysia, Mexico, Netherlands, Norway, Spain, Sweden, Switzerland. The majority of these restrictions are of the form that the fraction of equity that can be held by foreigners is uniform and restricted across all firms. The authors propose a model with a two country economy. There are no restrictions imposed upon investors of the foreign country who invest in domestic country firms. The foreign country restricts investments by domestic investors in that these investors can only hold a δ fraction of a firms's securities. They develop the model using the assumptions of the CAPM model. To test the model they use a 8-firm 20-person 2-country world with different δ amounts. They find that the optimal portfolio for domestic investors under no restriction is 56% of the shares of each of the foreign firms. As δ gets smaller than 56%, the prices and returns of domestic firms do not change, but the prices of foreign firms change in that the premium paid by domestic investors increases and the discounts demanded by foreign investors also increase.

Hietala (1989) studies asset pricing in a partially segmented market (Finland). Until January 1993 the Finnish law restricted the foreign ownership in any company to a maximum of 20% of the shares and prohibited domestic investors from investing in foreign securities. The unrestricted and restricted stocks of the same company have different prices. Hietala shows that most unrestricted stocks are sold at a premium. The amount of premium varies among stocks. He hypothesizes that foreign investors are willing to pay a price to engage in more comprehensive diversification and invest in foreign markets. Thus they require lower rates of returns than do domestic investors. The author forms a model that predicts that if foreign investors require a lower rate of return on a stock than do domestic investors, then the unrestricted stock is traded at a price premium. The price premiums are positively correlated with the domestic beta of the stock, with firm size, and the liquidity of the unrestricted stock.

The welfare impact of removal of international restrictions is investigated by Errunza and Losq (1989). Their model involves not a 2 country, but a N country world, and assumes mild segmentation. With capital flow controls investors can not hold the world market portfolio, instead they are forced to form national portfolios with a proxy for the world market portfolio. The authors conclude that removal of investment barriers would generally lead to an increase in the aggregate market value of securities affected by such a change. The introduction of different types of index funds in the barrier-free segment of the market would generally increase world market integration and investor welfare.

The Japanese government passed the Foreign Exchange and Foreign Trade Control Law in December 1980. The law eliminated most capital controls in Japan. Gultekin, Gultekin and Penati (1989) cite two types of reasons that can cause segmentation between two markets: 1. Barriers to international investments imposed by governments; 2. The irrational behavior of investors. They hypothesize that if government controls are the only source of segmentation then the price of risk should not be same in the Tokyo and New York stock markets before the end of 1980, but should be same after that date. They do not find any evidence of segmentation between the Japanese and U.S. security markets in the four years after liberalization and they reject the equality of the risk premia and return on the risk free asset before the liberalization. The authors conclude that government decisions are the primary sources of segmentation.

Bonser-Neal, et al. (1990) examine the effect of an announcement of changes in investment restrictions on closed end country funds which trade at large premiums relative to their net asset values. If international investment restrictions are binding then they can affect the ratio of a country fund's price to its net asset value. The ratio will increase as the restrictions become increasingly binding and will fall as the restrictions are removed or loosened. The authors find that an announcement of a liberalization is associated with a 6.8% decrease in the price-net asset value ratio during the three weeks surrounding the announcement, and this decrease is significant at the 1% level. Their results indicate that government imposed barriers are effective in segmenting international markets.

Recently, Fang (1991) investigates foreign stocks listed on the London exchange before and after October 1979 when British government abolished the foreign exchange control policy. Comparison of returns on foreign stocks before and after this date provides evidence regarding the effect of legal barriers on international asset pricing. She finds that U.S. stocks traded on the London exchange receive a higher required rate of return of 0.68% per month to cover the effect of foreign exchange control policy before October 1979.

Berstorm, Rydqvist and Sellin (1993) find a positive price differential between unrestricted and restricted shares of Swedish stocks. This differential is high for the companies with a high proportion of foreign investors. For others, the price differential is statistically negligible.

Booth, Chowdhury and Martikainen (1993) explore the dynamic properties of the price differential paid for Finnish unrestricted shares during the 1984-1989 period. The authors first compare the distributional characteristics of the unrestricted and restricted series. The mean unrestricted return is not significantly different from the mean restricted return. However unrestricted stock returns are more volatile than restricted ones. The two return series are cointegrated and the restricted returns Granger cause the unrestricted returns. They report that returns of the unrestricted shares are generated by an error correction mechanism. The authors conclude that their results support the hypothesis that the unrestricted shares overshoot relative to their fundamental values.

3.B. DATA AND DESCRIPTIVE TEST STATISTICS

Although the Istanbul Stock Exchange was established on January 1, 1986, reliable data on individual stocks are available only for the period after 1988. The data used in the dissertation contain the price changes of the stocks traded on the Istanbul Exchange between January 4, 1988 and July 31 1992. Those stocks that were delisted before July 31, 1992 are eliminated and the stocks that have at least 100 closing prices before July 31, 1992 are included. Table 3.3 presents the names and the capitalization of the companies in our sample. Then the price changes of each stock are calculated. The price changes are computed as the first differences of the closing prices.

$D_t = \ln P_{t+1} - \ln P_t$, P_t = price of the stock at the end of day.

TABLE 3.3
INFORMATION ABOUT LISTED COMPANIES

	NAME	INDUSTRY	TOTAL ASSETS (Million TL)
AAA	ADANA CIMENTO A	CEMENT	302,659
AAC	ADANA CIMENTO C	CEMENT	302,659
ABA	ABANA ELEKTRIK.	ELECTRICAL	N.A
AFC	AFYON CIMENTO	CEMENT	41,095
AKA	AKAL TEKSTIL	TEXTILE	286,310
AKB	AKBANK	BANKING	18,521,644
AKC	AKCIMENTO	CEMENT	368,116
AKS	AKSA	TEXTILE	854,747
ALAK	ALARKO HOLDING	HOLDING	131,746
ALAS	ALARKO SANAYI	INDUSTRY	N.A.
ALTY	ALTINYILDIZ	TEXTILE	310,773
ANA	ANADOLU CAM	GLASS	216,387
ARC	ARCELIK	ELECTRICAL	1,804,454
ASEL	ASELSAN	DEFENSE	719,023
AYG	AYGAZ	ELECTRICAL	729,027
BAG	BAGFAS	FERTILIZER	386,686
BOL	BOLU CIMENTO	CEMENT	237,568
BRI	BRISA	TIRE	886,763
CAN	CANNAKKALE CIMENTO	CEMENT	502,225
CEL	CELIK HALAT	STEEL	131,834
CIMS	CIMSA CIMENTO	CEMENT	334,529
CUK	CUKUROVA ELEK.	ELECTRICAL	1,461,972
DEM	DEMIRBANK	BANKING	1,714,044
DEN	DENIZLI CAM	GLASS	36,189
DEVA	DEVA	PHARMACEUTICAL	233,847
DOG	DOGUSAN	PIPE	40,334
DOK	DOKTAS	IRON	188,936
ECZ	ECZACIBASI YAT.	INVESTMENT	115,839
ECZI	ECZACIBASI ILAC	PHARMACEUTICAL	1,050,173
EGEB	EGE BIRACILIK	BEER	317,725
EGEE	EGE ENDUSTRI	INDUSTRIAL	90,842
EGEG	EGE GUBRE	FERTILIZER	111,488
EMEK	EMEK SIGORTA	INSURANCE	104,970
ENK	ENKA HOLDING	HOLDING	72,365
ERC	ERCIYAS BIRACILIK	BEER	200,759
ERE	EREGLI DEMIR CELIK	IRON	4,679,994
FIN	FINANSBANK	BANKING	853,382
GEN	GENTAS	METALLIC	54,947
GOOD	GOODYEAR	TIRE	379,668
GOR	GORBON ISIL	CERAMIC	8,969
GUB	GUBRE FABRIKALARI	FERTILIZER	437,536
GUN	GUNEY BIRACILIK	BEER	129,353
HEK	HEKTAS	AGRICULTURE	142,651
HURG	HURRIYET GAZETE	NEWSPAPER	N.A
IKT	IKTISAT FIN.	LEASING	292,203

(table con'd)

TABLE 3.3
INFORMATION ABOUT LISTED COMPANIES

NAME		INDUSTRY	TOTAL ASSETS (Million TL)
INT	INTEMA INSAAT	CONSTRUCTION	26,766
ISM	I.MOTOR PISTON	AUTOMOTIVE	132,651
IZM	IZMIR DEMIR CELIK	IRON	1,197,203
IZO	IZOCAM	GLASS	147,187
KAR	KARTONSAN	PAPER	382,156
KAV	KAV	FORESTRY	109,944
KEL	KELEBEK MOBILYA	FURNITURE	77,433
KEN	KENT GIDA	FOOD	178,357
KEP	KEPEZ ELEKTRIK	ELECTRICAL	217,678
KOCH	KOC HOLDING	HOLDING	1,008,787
KOCY	KOC YATIRIM	INVESTMENT	156,861
KON	KONYA CIMENTO	CEMENT	109,587
KORD	KORDSA	TEXTILE	491,565
KORU	KORUMA ENDUSTRI	AGRICULTURE	158,975
KOY	KOYTAS	TEXTILE	31,689
KUT	KUTAHYA PORSELEN	PORCELAIN	72,238
MAK	MAKINA TAKIM	MECHANICAL	96,219
MARE	MARET	MEAT	143,639
MARM	MARMARIS MARTI OTEL	LODGING	57,430
MARMA	MARMAR. ALTINYUNUS	LODGING	65,817
MBV	MARSHALL	PAINT	169,708
MEN	MENSUCAT SANTRAL	TEXTILE	1,153,133
MIG	MIGROS	FOOD	197,815
NAS	NASAS	ALUMINUM	333,802
NET	NETBANK	BANKING	N.A
NETH	NET HOLDING	HOLDING	273,179
NETT	NET TURIZM	TOURISM	310,007
NIG	NIGDE CIMENTO	CEMENT	42,445
OKAN	OKAN TEKSTIL	TEXTILE	258,620
OLM	OLMUKSA	PAPER	164,640
OTO	OTOSAN	AUTOMOTIVE	525,382
PAR	PARSAN	MECHANICAL	250,787
PEG	PROFILO	ELECTRICAL	877,107
PET	PETKIM	PETROLEUM	5,890,906
PETR	PETROKENT TURIZM	TOURISM	112,393
PIN	PINAR SUT	MILK	177,387
PINE	PINAR ENTEGRE ET	MEAT	238,850
PINSU	PINAR SU	WATER	78,541
PINU	PINAR UN	FLOUR	13,966
PMA	PIMAS	PIPE	121,401
POAS	PETROL OFISI	PETROLEUM	N.A.
RAB	RABAK	COPPER	561,749
SANT	SANTRAL HOLDING	HOLDING	294,830
SAR	SARKUYSAN	COPPER	259,198
SIF	SIFAS	TEXTILE	281,529

(table con'd)

TABLE 3.3
INFORMATION ABOUT LISTED COMPANIES

	NAME	INDUSTRY	TOTAL ASSETS (Million TL)
SKS	SOKSA	TEXTILE	20,558
SON	SONMEZ FILAMENT	TEXTILE	182,941
SUNE	SUN ELEKTRIK	ELECTRICAL	51,027
TEL	TELETAS	COMMUNICATION	848,024
TDT	T. DISBANK	BANKING	N.A.
TGAR	TURK. GARANTI BANK	BANKING	11,670,847
TIB	TURKIYE IS BANKASI	BANKING	27,679,934
TIR	TIRE KUTSAN	PAPER	98,368
TKB	TURK. KALKINMA BANK	BANKING	5,336,290
TOF	TOFAS OTOMOBIL FAB.	AUTOMOTIVE	1,598,736
TOFO	TOFAS OTO TICARET	AUTOMOTIVE	506,231
TRK	TOPRAK KAGIT	PAPER	211,413
TSI	TURK SIEMENS	ELECTRICAL	251,837
TSIC	TURKIYE SISE CAM	GLASS	725,901
TSKB	T.SINAAI KAL. BANK	BANKING	4,946,876
TUDD	TURKIYE DEMIR DOKUM	IRON	595,949
TURP	TUPRAS	PETROLEUM	6,782,668
TURY	TURK HAVA YOLLARI	AIRLINE	4,702,233
TUTU	TURK TUBORG	BEER	334,908
TUYT	TUTUNBANK	BANKING	4,084,668
UNYE	UNYE CIMENTO	CEMENT	99,231
USS	USAK SERAMIK	CERAMIC	60,186
VAKY	VAKIF YATIRIM	INVESTMENT	6,240
VES	VESTEL	ELECTRICAL	1,251,272
VKL	VAKIF FIN. KIR	LEASING	407,936
YAS	YASAS	PAINT	208,925
YKB	YAPI KREDI BANKASI	BANKING	19,030,351
YUN	YUNSA	TEXTILE	340,453

The series are described by using various statistics. The location of each series is reported with mean, and median. The dispersion of the series is reported with standard deviation, interquartile range . Finally skewnessand kurtosis of the series are reported. The following hypotheses are tested by using t statistic, whether the population means for the daily and the weekly data are different from zero.

In the second part of the chapter the descriptive statistics of the price changes before and after August 11, 1989 are reported. The means and the variances of the stocks in these periods are examined and whether they are equal to each other or not is tested. The following null hypothesis H_o: $\mu_1=\mu_2$ of equality of two period means is tested by assuming that the populations are normally distributed. Depending on the equality of the two population variances, either the t statistic or the approximate t statistic are used to determine equality of two period means. To test the assumption that the variances are equal the folded form of the F statistic is utilized.

$$\acute{F}=(\text{larger of } s_1^2, s_2^2)/(\text{smaller of } s_1^2, s_2^2)$$

where s_1^2 and s_2^2 are the sample variances.

If two population variances are equal then the following t statistic is used.

$$t=(\overline{x}_1-\overline{x}_2)/\sqrt{s^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$$

where $\overline{x}_1$, $\overline{x}_2$ *are the sample means*

s^2 is the pooled variance, n_1 and n_2 are the number of observations in each sample.

$$s^2=\frac{[(n_1-1)s_1^2+(n_2-1)s_2^2]}{(n_1+n_2-2)}$$

In case of unequal variances the approximate t statistic is computed as follows:

$$t=\frac{(\overline{x}_1-\overline{x}_2)}{\sqrt{(w_1+w_2)}}$$

where $w_1 = s_1^2/\ n_1$ $\qquad w_2 = s_2^2/\ n_2$

The degrees of freedom are calculated according to the Satterhwaite's (1946) formula.

$$df=\frac{(w_1+w_2)^2}{\frac{w_1^2}{(n_1-1)}+\frac{w_2^2}{(n_2-1)}}$$

This method assumes that price change distribution is normal. Our analysis indicate that Turkish stock price changes are not normally distributed similar to U.S and other stock returns. However, Lehman (1986) advocates that this test is not sensitive to nonnormality.

The equality of means hypothesis is also tested with the test statistic that is designed for nonnormal data. With nonnormal data, we check our hypothesis of equal means with Wald statistic as is suggested by Judge, et al. (1988). The null hypothesis and the test statistic is given by the following formulas:

H_0: $\mu_a=\mu_b$, the means in two periods are equal.

$$W=[(\mu_a-\mu_b)'(Var[(\mu_a-\mu_b)-0])^{-1}(\mu_a-\mu_b)]\sim\chi_1^2$$

The first hypothesis that is tested, is whether or not the series follow a normal distribution. The Shapiro-Wilk test statistic is used to test normality. This statistic is very powerful for small samples (samples with 2000 observations or less) and quite sensitive against a wide range of alternatives. The Shapiro-Wilk test statistic is obtained by dividing the best estimator of the variance (based on the square of a linear combination of the order statistics) to the usual corrected sum of squares estimator of the variance. For a vector $y' = (y^1, \ldots\ldots, y^n)$ of ordered observations, the statistic is defined as follows.

$$W = \frac{\left(\sum_{i=1}^{n} a_i y_i\right)^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2}$$

where a_i= the normalized best linear unbiased coefficients. The approximations for these coefficients as calculated in Shapiro and Wilk (1965) are used. The significance level of W is obtained by Royston's (1982) approximate normalizing transformation

$$Z_n = \frac{(1-W)^{\gamma} - \mu)}{\sigma}$$

where Z_n is a standard normal variate. Large values of Z_n indicate departure from normality. γ, μ, σ are functions of n obtained from Roystons' simulation results.

If the series are normally distributed then the third and fourth moments should have values of 0 and 3 respectively. Normality is tested with another method based on Kiefer-Salmon statistics. Sample skewness and kurtosis statistics are calculated using the following formulas:

$$S=\left(\frac{n}{6}\right)(u_3-3u_1)^2$$

$$K=(n/24)(u_4-6u_2+3)^2$$

u_i = i th sample moment about the mean. KS= S+K

$$S\sim\chi_1^2 \quad K\sim X_1^2$$

$$KS\sim\chi_2^2$$

H_o: $\mu_3=0$ and $\mu_4=3$.

The hypotheses that the skewness and kurtosis have the same values as those of normal distribution are tested.

The t statistic is used to investigate whether return means are equal to zero . The following formulas are employed for reporting the standard errors of skewness and kurtosis.

$$Std.\ err.\ of\ skewness=\sqrt{\frac{6}{n}},\quad Std.\ err.\ of\ kurtosis=\sqrt{\frac{24}{n}}$$

The next hypothesis that is tested is the hypothesis of strict white noise[8]. Then the question of whether there is nonlinear dependency in the series or dependence in squared and absolute return series is investigated. First the Box-Pierce portmanteau test as modified by Ljung and Box (1978) is used to test whether the return series follow white noise and to check the presence of nonlinear dependency in the squared return series and in the absolute value series. Let W_t be generated by the ARMA (p,q) process. The Ljung-Box portmanteau Q statistic is given by the following formula:

$$Q=n(n+2)\sum_{k=1}^{M}\frac{r_k^2}{n-k}\sim\chi^2_{M-p-q}$$

$$where\ r_k=\sum_{k=1}^{n-k}\frac{a_t a_{t+k}}{\sum_{k=1}^{n}a_t^2}$$

where a_t are the residual sequence, M is the maximum number of lags, p is the order of the autoregressive component and q is the order of the moving average component.

For the null hypothesis that the series follow a strict white noise process, p=q=0 .

[8] A white noise is a process whose mean and covariances do not depend on time. The autocovariances are zero at all lags. If all moments of a series are independent over time, then the process is a strict white noise. If the original series is a strict white noise, then the squared and absolute value series are also strict white noise.

Spectral analysis is an alternative to studying autocorrelations. It is particularly appropriate when cycles occur in the process, instead of random distribution. Based on spectral analysis and periodogram we use the Fisher's Kappa and Bartlett's Kolmogorov Smirnov statistics to test the strict white noise hypothesis. Both of these tests use the periodogram of the price changes and both of them are spectral density tests. Fisher's test is used to search for "hidden periodicities or cycles". The null model is the following:

$$H_o: X_t = \mu + \epsilon_t$$

The alternative model is:

$$H_a: X_t = \mu + ACoswt + BSinwt + \epsilon_t$$

where A, B, are constants and w is unknown. We search out the largest periodogram ordinate and ask if this ordinate can be considered the largest in a random sample of size m selected from a distribution function that is a multiple of a chi-square with two degrees of freedom. The Fisher's Kappa statistic is given by the following formula:

$$\xi = [\frac{1}{m}\sum_{k=1}^{m} I_n(w_k)]^{-1} I_n(L)$$

where m=sample size $I_n(L)$= largest periodogram ordinate in a sample of m periodogram ordinates. The distribution of the statistic is given by Fuller (1976). Rejection of the null hypothesis indicates the presence of cycles in the data.

The Kolmogorov-Smirnov test is designed to test the null hypothesis that a time series is normal white noise. The test is based on the normalized cumulative periodogram which is given by the following formula:

$$C_k = cum(I_n(w_k)) = [\sum_{j=1}^{m} I_n(w_j)]^{-1} \sum_{j=1}^{k} I_n(w_j)$$

If the null hypothesis that the time series is a normal white noise process is true then the normalized cumulative periodogram for k=1,... m-1 has the same distribution function as that of an order sample of size m-1 selected from the uniform (0,1) distribution.[9]

The null hypothesis of no heteroskedasticity in the data is tested with three tests: 1- ARCH test, 2- Breusch, Pagan and Godfrey test (B.P.G), 3- Harvey's test.

ARCH test is designed to detect autoregressive conditional heteroskedasticity in the data. The model is the following:

$$y_t = X'_t \beta + \varepsilon_t$$

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[9] The distribution of Fisher's Kappa is given on page 284 and that of Bartlett's statistic on page 286 of Fuller(1976).

The conditional variance is given by the following formula:

$$\varepsilon_t^2=\alpha_0+\sum_{i=1}^{p}\alpha_i\varepsilon_{t-i}^2$$

Our null hypothesis is the following.

H_o: $\alpha_1=\alpha_2=\ldots\ldots\ldots\ldots\ldots\ldots\alpha_p=0$

The first order ARCH effect in the data is tested. The explained sum of squares (R^2) is obtained using the following regression equation.

$$\varepsilon_t^2=\alpha+\beta\varepsilon_{t-1}^2$$

The Lagrange multiplier test statistic for the null hypothesis of no conditional heteroskedasticity is given by the following formula:

$$ARCH=N*R^2\sim\chi_1^2$$

The second test is developed by Breusch and Pagan to examine whether or not disturbance variance vary with a set of regressors. The null and the alternative hypotheses are the following:

H_o: $\alpha_1=0$, $H_a=\epsilon_t^2= f(\alpha_0+\alpha_1\ y_{t-1})$

With ordinary least squares regression of ϵ^2 on y_{t-1} variable we obtain R^2, the test statistic is again a Lagrange multiplier statistic given by the following formula:

$LM= 1/2 * R^2$, and this statistic is distributed by chi-square with one degree of freedom.

The third test statistic or Harvey's test statistic is very similar to the Breusch-Pagan test except the alternative hypothesis is multiplicative heteroskedasticity.

H_o: α_t=0, H_a: ϵ_t^2= $\exp(\alpha_0+\alpha_1\ y_{t-1})$

The logarithm of error variances are regressed on y_{t-1} and the previously described test statistic is used.

The following tests are used to further investigate the independent and identical distribution hypothesis: 1-BDS test, 2-Third order moment test, 3- Long term memory test.

The BDS statistic is used to determine whether a financial series is independently and identically distributed. If y_t is an independently and identically distributed time series of length T and M is the embedding dimension, then M histories can be created in the following way:

$$y_t^M=(y_t, y_{t+1}, \ldots\ldots, y_{t+M-1})$$

The correlation integral can be defined as follows:

$$C^M(\epsilon, T) = 2[(T-M-1)(T-M)]^{-1} \sum_{1\leq j\leq (T-M-1)} I_\epsilon(y_i^M - y_j^M)$$

where I_ϵ is an indicator function that equals one if $||\ y_i^M - y_j^M\ || < \epsilon$ and zero otherwise, and where $||.||$ is a measure of distance between y_i^M and y_j^M, and the distance measure employed herein is the sup-norm. BDS test statistic relates C^M to C^1 the correlation integral with the smallest embedding dimension.

$$BDS(\epsilon, T) = T^{0.5}\frac{[C^M(\epsilon, T) - C^1(\epsilon, T)^M]}{V^M(\epsilon)}$$

V^M is the variance of the numerator's limiting distribution. This statistic is distributed normally with a zero mean and unit variance.

It is important to choose an ϵ that is neither too large nor to small. If it is too large, $C^M(\epsilon,T) = 1$ and no information is gained. If it is too small then $C^M(\epsilon,T) = 0$. Generally a value of ϵ between $0.5\sigma \leq \epsilon \leq 1.5\sigma$ is appropriate. We use ϵ/σ ratio of 1 and M dimension as 5. If we reject the null hypothesis this indicates that there is either structural change in the data, or series is generated by nonlinear stochastic systems or by low complexity chaotic behavior.

Hsieh (1991) proposes a third order moment test to investigate whether nonlinearity exists in mean or in variance. For a nonlinear time series $y_t = f(y_{t-1},..) + \epsilon_t$, we test the null hypothesis that f( )=0. Under the null, the unconditional third order moments, $E(y_t y_{t-i} y_{t-j}) = 0$ for $i,j>0$. For multiplicative heteroskedastic distributions, the null hypothesis will be failed to reject. The population third order moment is given by:

$$\rho(i, j) = E[y_t y_{t-i} y_{t-j}] / \sigma^3$$

The joint null hypothesis is tested:

$$H_o : \rho(i,j) = 0 \quad for \ 0 \le i \le j \le m$$

The following sample third order moment and cross moments formulas are utilized and the test statistic is calculated.

$$r(i,j) = \frac{\left(\frac{\sum y_t y_{t-i} y_{t-j}}{T}\right)}{\left(\frac{\sum y_t^2}{T}\right)^{1.5}}$$

$$c.m((ij),(\acute{i}\acute{j})) = \frac{\left[\sum\left(\frac{y_t y_{t-j} y_{t-i}}{T} - r(i,j)\right)\left(\frac{y_t y_{t-\acute{i}} y_{t-\acute{j}}}{T} - r(\acute{i},\acute{j})\right)\right]}{\left[\frac{\sum y_t^2}{T}\right]^3}$$

The m is taken as 5 as is suggested by Hsieh(1991). The null hypothesis is rejected if nonlinearity is not caused by multiplicative heteroskedasticity.

The modified rescaled range test as suggested by Lo (1991) is used to test for long run memory in the Turkish price series. The null hypothesis assumes that the time series is strong mixing.[10] A time series is strong mixing if the maximal dependence between events at any two dates becomes very small as the time span between the dates increases. The modified rescaled range statistic is given by:

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[10] Lo (1991) adopts strong mixing as an operational definition of short range dependence.

$$Q_n=\frac{1}{\hat{\sigma}_n(q)}\left[Max_{1\le k\le n}\sum_{j=1}^{k}(X_J-\overline{X}_n)-Min_{1\le k\le n}\sum_{j=1}^{k}(X_j-\overline{X}_n)\right]$$

The first term is the maximum of the partial sums of the first k deviations of X_j from the sample mean. The second term is the minimum of the partial sums.

$$\hat{\sigma}_n^2(q)=\frac{1}{n}\sum_{j=1}^{n}(X_j-\overline{X}_n)^2+\frac{2}{n}\sum_{j=1}^{n}w_j(q)\sum_{i=j+1}^{n}(X_i-\overline{X}_n)(X_{i-j}-\overline{X}_n)$$

where $w_j(q)= 1- (j/q+1)$ for $q<n$

q is the truncation lag. The results of the statistic are reported with truncation lags chosen according to data automated criterion suggested by Andrews (1991) . In the presence of positive long range dependence, the statistic diverges in probability to infinity and in the presence of negative long range dependence it converges to zero. The null hypothesis of strong mixing is accepted if the test statistic has a value within the range (0.809-1.862) which corresponds to 5% significance. If the null hypothesis is rejected then it indicates that long term memory or cycles exist in the data set.

Unless a series is stationary, it is not possible to estimate the parameters of it reliably. A stochastic process whose first and second order moments (means, variances, and covariances) do not change with time is said to be second order stationary. The stationarity of the Turkish stock prices is checked with the unit root test. The following

Augmented Dickey Fuller regression equation is used:

$$\Delta Y_t=\alpha_0+\alpha_1 Y_{t-1}+\alpha_2 t+\sum_{j=1}^{p}\gamma_j\Delta Y_{t-j}+\varepsilon_t$$

If a unit root exists then $\alpha_1=0$. Both the Augmented Dickey Fuller and Phillips-Peron statistics for the null hypothesis of $\alpha_1=0$ are reported. H_0: $\alpha_1=0$ or a unit root exists.

Phillips-Peron method uses a non parametric correction for serial correlation. The method first calculates the above unit root tests from regression equations with p=0. The statistics are then transformed to remove the effects of serial correlation on the asymptotical distribution of the test statistic. The lag length is chosen as the highest significant lag order from the autocorrelation function of the first difference series. The unit root hypothesis can be rejected if the test statistic is smaller than the critical value.

3.C. RESULTS OF THE DAILY AND THE WEEKLY DATA

1. Daily data

The descriptive statistics for the daily data are presented in Table 3.4. The detailed tables of statistics are presented in the appendix section and summary of each table is presented within the text. The majority of the stocks (88 out of 119) have negative mean price changes. The highest standard deviation is 0.2109 (AAA) and the lowest is 0.0209 (ALTY). The median return is zero for all stocks.

The interquartile range of the price changes range from a high of 4.7141 (AAC) to a low of 0.1734 (SON). All but eleven of the stocks exhibit negative skewness. For majority of the stocks the distribution is skewed to the left with the highest skewness of -17.2722 (AAA) . The following stocks exhibit negative kurtosis: AFC, AKA, KUT, PINU, POAS, TURP, TUTU. The other stocks show leptokurtosis with the highest being ERE (Eregli Demir Celik) indicating that the distributions have thick tails. Fifty stocks have kurtosis values greater than 50 and 8 stocks have skewness values less than -10.

The hypothesis of population means of the distributions equal to zero is tested with usual t statistic. The averages of the t statistics and the standard errors of skewness and kurtosis are presented. Table 3.5 exhibits the t statistics for various stocks. The results indicate that the means of the two stocks (EGEB and VES) are significantly different from zero. All the other means are not significantly different from zero.

The null hypothesis of normality is tested by using Shapiro-Wilk and Kiefer Salmon test statistics.

H_0: the time series is distributed normally. The normality test results are presented in Table 3.6. Using the Shapiro Wilk statistic, normality is rejected for nearly all stocks. For the following stocks we fail to reject normality: ABA, AKA, ALAS, KON, and TAMSI. Then normality is checked by

TABLE 3.4
SUMMARY OF DESCRIPTIVE STATISTICS
DAILY DATA

	mean	std dev	skewness	kurtosis	range
Mean	-0.0014	0.0645	-4.2056	64.1822	0.9715
Number of negative observations	88	N.A.	108	7	N.A.
Number of securities with values greater than 50.00	N.A.	N.A.	N.A.	50	N.A.
Number of securities with values less than -10.00	N.A.	N.A.	8	N.A.	N.A.

TABLE 3.5
SUMMARY OF T STATISTICS FOR TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS
DAILY DATA

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
Average	-0.3852	0.1023	0.2059
Number of significant observations rejecting equality of population means	2	N.A.	N.A.

using the Kiefer-Salmon statistics for skewness and kurtosis. High values of the S statistics lead to the rejection of the null hypothesis that the third moment equals to zero for all the stocks except seventeen. The K statistics (sample kurtosis statistics) for the kurtosis are significant for all stocks, indicating that the distributions have thicker tails than a normal distribution. Using KS statistics we reject normality for all stocks. All of these statistics indicate that Turkish stocks are highly nonnormal, similar to U.S stocks.

The values of Fisher's Kappa and Bartlett's statistics are examined to determine whether the series are independent white noise processes. Fisher's test is designed to detect hidden cycles in the data. With Fisher's Kappa statistic we reject the null hypothesis of white noise (no hidden cycles) for only four out of one hundred and nineteen stocks. On the other hand Bartlett's test rejects the hypothesis that the data comes from a normal white noise for seventy stocks.

Next, the degrees of autocorrelation in the mean and the variance are examined. Since the hypothesis that the population means are equal to zero is not rejected, squared returns can be used for variance in autocorrelation tests. If a time series is strict white noise, then all of its moments are independent and uncorrelated. To verify the null hypothesis that the series is white noise autocorrelation in the original data, squared data and in the

TABLE 3.6
SUMMARY OF TESTS FOR NORMALITY AND WHITE NOISE PROCESSES
DAILY DATA

	W Shapiro Wilk	KS Kiefer Salmon	κ Fisher	B Bartlett
Mean	0.7891	372,609	5.8547	0.0716
Percentage of significant observations rejecting normality	95.80	100.00	N.A.	N.A.
Percentage of significant observations rejecting white noise	N.A.	N.A.	3.36	58.82

The critical values of the Shapiro Wilk statistics depend on sample sizes. Small test statistics are significant, i.e. indicate nonnormality

absolute value data are investigated. The Ljung-Box statistics on the original price changes D, the squared changes and the absolute changes of D are exploited. First the existence of ARCH effect in the data is investigated. The Ljung Box statistics need to be modified if ARCH effects exist in the data. Next table represents the results of ARCH and other heteroskedasticity tests for daily, weekly and before and after August 11, 1989 data.

H_0: the time series is homoskedastic,

For daily data ARCH effect does not exist for majority of the stocks (99 out of 119). Twenty stocks that exhibit ARCH effects are very small and less frequently traded stocks. The BPG (Breusch, Pagan and Godfrey) test rejects the hypothesis for only 8 stocks and the Harvey test rejects for 33 stocks.

Since significant ARCH effects do not exist, the original Ljung Box statistics are used. Table 3.8 and Table 3.9 show these statistics. For the original series the null hypothesis is rejected for only 27 out of 119 stocks. There is no statistically significant first order dependency in 92 stocks. Among 119 stocks, 56 stocks exhibit significant first lag dependence.

TABLE 3.7
TESTS FOR HETEROSKEDASTICITY

	ARCH	B.P.G	HARVEY
Number of daily observations that rejects homoskedasticity	20	8	33
Number of weekly observations that rejects homoskedasticity	11	10	14
Number of daily observations that rejects homoskedasticity (before August 11,1989)	9	9	15
Number of daily observations that rejects homoskedasticity (after August 11,1989)	8	3	16

For the higher order dependency, the Ljung- Box statistics of the squared and the absolute value of the price changes are examined. The null hypothesis is rejected for only twenty two stocks in squared returns. The situation for the absolute value series is completely the opposite of the squared series, we reject the null hypothesis for the majority of the stocks (eighty six out of one hundred and nineteen stocks).

Examining the Ljung-Box statistics, indicates that there are no linear dependencies in Turkish daily price changes. For the higher order dependencies we come to the same conclusion for the squared series. On the other hand our data indicates significant higher order dependency in the absolute value series. Only 28 out of 119 stocks does not exhibit both linear and nonlinear dependence leading us to reject the strict white noise hypothesis for the majority of the stocks.

The results indicate that Turkish stocks are negatively skewed, highly leptokurtic and nonnormal similar to US stocks and European stocks (e.g. Fama (1963), and Solnik (1973)). The majority of the studies for the U.S and other markets fail to find significant linear dependence, but find significant nonlinear dependence (Akgiray (1989), Koutmos (1991), Sewell, et al.(1993)). Turkish stock prices exhibit the same pattern as the previous studies for other developed and developing market.

Next the reasons that Turkish stock prices do not follow white noise are investigated. Table 3.10 exhibits results of BDS, long term memory and third order moment tests.

The existence of the long term dependence in the data is examined. The results of modified rescaled range test indicate that 13 stocks exhibit long term dependence.

TABLE 3.8
SUMMARY STATISTICS FOR TESTS OF
LINEAR AND NONLINEAR DEPENDENCE
DAILY DATA

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$
Mean	9.359	4.276	42.020
Number of significant observations leading to accept dependence	27	22	86

TABLE 3.9
SUMMARY STATISTICS FOR TESTS OF
LINEAR AND NONLINEAR DEPENDENCE
(AUTOCORRELATIONS)
DAILY DATA

	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$
Mean	0.049	0.045	0.135
Number of significant observations leading to accept dependence	56	24	101

The independent and identical distribution hypothesis is investigated with BDS test and is rejected for all but seven stocks. Results of BDS test combined with Ljung Box statistics indicate that some kind of nonlinearity exist in the data. Next third order statistics are examined to differentiate between different kinds of nonlinearities.

The third order test as is described by Hsieh (1991) is used to identify stochastic nonlinearity in the data.

H_0: population third order moment is zero in the data.

The preliminary results indicate that the null hypothesis of zero third order moment is not rejected.

TABLE 3.10
SUMMARY TESTS FOR BDS, THIRD ORDER AND LONG TERM MEMORY

	BDS	R/S	THIRD
Number of significant observations leading to reject independent and identical distribution	112	N.A.	N.A.
Number of significant observations leading to accept existence of long term dependence	N.A.	13	N.A.
Number of significant observations leading to fail to reject zero third order moment	N.A.	N.A.	119

The results of unit root tests for daily and before and after August 11, 1989 data are given by Table 3.11. Augmented

Dickey Fuller tests reject the hypothesis of a unit root for only 37 out of 119 stocks for daily data. However, when we calculate the Phillips-Perron test which corrects for serial correlation , 103 stocks reject existence of a unit root. It is concluded that the majority of the stocks are stationary using the Phillips-Perron test.

TABLE 3.11
SUMMARY TABLE FOR TESTS OF UNIT ROOT

	ADF P	ADF ΔP	PP P	PP ΔP
Number of significant observations leading to reject a unit root, daily data	37	81	103	16
Number of significant observations leading to reject a unit root, before August 11,1989	6	50	19	37
Number of significant observations leading to reject a unit root, after August 11,1989	25	31	50	6

2. Weekly data

Now the weekly results are examined. The descriptive statistics are given in table 3.12. The majority of the stocks have negative means (ninety one out of one hundred nineteen stocks). The highest standard deviation is 0.4609 (AAA) and the lowest one is 0.0459 (ALTY). Ninety four stocks exhibit negative skewness and all stocks exhibit positive kurtosis. In weekly data departures from normality are reduced. The negative skewness numbers and the positive large kurtosis numbers are all reduced with the weekly data. With weekly data only 5 stocks exhibit kurtosis values greater than 50 and no stocks exhibit skewness values less than -10.

TABLE 3.12
SUMMARY OF DESCRIPTIVE STATISTICS
WEEKLY DATA

	mean	std dev	skewness	kurtosis	range
Mean	-0.0700	0.1521	-1.5511	12.8190	1.2521
Number of negative observations	91	N.A.	94	0	N.A.
Number of securities with values greater than 50.00	N.A.	N.A.	N.A.	5	N.A.
Number of securities with values less than -10.00	N.A.	N.A.	0	N.A.	N.A.

Table 3.13 presents the results of the tests that the population means are zero. The following three stocks have means significantly different from zero: AKB, EGEB, and PAR. All the other stocks have means statistically indistinguishable from zero.

The results of normality tests are given in Table 3.14. The Shapiro-Wilk statistics reject normality in all but nine stocks. All stocks exhibit significant leptokurtosis, although less than those of the daily data. Utilizing the Kiefer-Salmon statistics normality is rejected for all stocks With weekly data the amount of excess kurtosis and skewness

TABLE 3.13
SUMMARY OF T STATISTICS FOR TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS
WEEKLY DATA

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
Average	-0.4817	0.2319	0.4574
Number of significant observations rejecting equality of population means	3	N.A.	N.A.

decrease, but the price series are still not normal. These results are not surprising given the fact that U.S and other international stocks' weekly returns deviate from normality less than daily returns. When the results of the white noise tests are examined, the Fisher's Kappa statistic rejects the hypothesis for one stock and the Bartlett's statistics reject the hypothesis for thirty four stocks. Both of the spectral density statistics also indicate less deviation from white noise hypothesis. The existence of hidden cycles in the weekly data is rejected and the white noise hypothesis is not rejected for majority of the stocks (85 out of 119) using Bartlett's test.

With weekly data, ARCH test rejects homoskedasticity for 11 stocks, BPG test rejects for 10 stocks and Harvey's test rejects for 14 stocks.

TABLE 3.14
SUMMARY OF TESTS FOR NORMALITY AND WHITE NOISE PROCESSES
WEEKLY DATA

	W Shapiro Wilk	KS Kiefer Salmon	κ Fisher	B Bartlett
Mean	0.8550	3008	4.2669	0.1258
Percentage of significant observations rejecting normality	92.44	100.00	N.A.	N.A.
Percentage of significant observations rejecting white noise	N.A.	N.A.	0.01	28.57

The results of the Table 3.15 indicate that the null hypothesis of no linear dependency is rejected for only ten stocks. In other words, only ten stocks exhibit linear dependence. Thirteen stocks exhibit dependency in squared series. For the absolute value series, unlike those of daily data only twenty two stocks exhibit dependence. Both linear and nonlinear dependence are rejected in weekly price changes. The strict white noise hypothesis is rejected for only 31 stocks. The majority of stocks (88 out of 119) exhibit neither linear nor nonlinear dependence in weekly data. Eighteen stocks exhibit significant lag 1 dependence with weekly data.

TABLE 3.15
SUMMARY STATISTICS FOR TESTS
OF LINEAR AND NONLINEAR DEPENDENCE
WEEKLY DATA

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$
Mean	6.030	5.140	9.030
Number of significant observations leading to accept dependence	10	13	22

TABLE 3.16
SUMMARY STATISTICS FOR TESTS
OF LINEAR AND NONLINEAR DEPENDENCE
(AUTOCORRELATIONS)
WEEKLY DATA

	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$
Mean	0.008	0.058	0.103
Number of significant observations leading to accept dependence	18	12	19

Neither daily nor weekly price changes exhibit linear dependence. The departures from normality and the amount of autocorrelation decrease as we increase the interval of the price changes. The daily data show significant dependence in absolute value data. For weekly data, on the other hand, the strict white noise hypothesis is not rejected for the majority of the stocks.

The analysis indicates that the statistical properties of daily Turkish price changes are similar to the properties of the U.S., European and other emerging stock exchange distributions as are reported by previous research. Daily price changes are heavily leptokurtic and therefore are nonnormal. Significant nonlinear dependence is found as are reported about unconditional distributions of the U.S and other stock markets. However, unlike most of the previous studies of various stock markets, Turkish stock distributions do not show linear dependence.

In the next section the possible effects of opening of the Istanbul Stock Market to foreigners are studied.

3.D. RESULTS OF THE DAILY DATA BEFORE AND AFTER AUGUST 11, 1989

The liberalization process in the Turkish economy started with the announcement of January 24, 1980 decree and continued with additional measures during 1980s. The revitalization of the capital markets and the opening of the Istanbul Stock Exchange were parts of these measures. Based on the previous studies, it is hypothesized that this event caused a structural shift in stock price changes. We hypothesize that means of the stocks will not be different in two periods but variances will be different in two periods. Booth, Chowdhury and Martikainen (1993) find that the mean return on the restricted Finnish Stock Index is not significantly different from that of the unrestricted one. However, unrestricted share prices are significantly more volatile than that of restricted shares. As is documented by the previous authors the policy changes by government causes structural changes and especially volatility changes. Next the statistical properties of the 56 stocks that were listed on the exchange before August 11, 1989 are examined and the distribution of the series before and after this date are compared to determine whether the opening of the stock exchange to foreign investors affected the stocks significantly. It is hypothesized that the means of stocks will not change as a result of this event, because foreigners will not invest heavily in the exchange considering political instability. However, this event will increase volatility. This decision leads two different types of actions that can affect the stock prices. 1- Foreign investors start investing heavily in the Istanbul Stock Exchange. 2- Domestic investors start investing in other stock exchanges. Both of these actions are expected to increase the efficiency of the companies in order to satisfy foreign investors and domestic investors who can invest in other markets if they are not satisfied with the companies. However, if foreign investors find the market very risky and the returns not satisfactory to compensate the risk, then they will not invest heavily in the market and consequently their actions will not affect the companies. For domestic investors the stock market is not the only nor the most popular investment source. Turkish investors similar to investors of other politically unstable developing country investors consider investment in real estate, in gold as the major long term investment tools. Government bonds and short term bank saving accounts are the primary short term investment tools. As a result actions of domestic investors are not expected to affect the stock prices considerably. Foreign investors' actions will affect the market returns if they invest in market heavily.

Theoretical literature (Gultekin, Gultekin and Penati (1989), Fang (1991)) show that government actions regarding liberalization affect stock returns significantly. However, all the cited countries are developed and politically stable countries. Our null hypothesis is that the means of stock returns are not different from each other after liberalization of stock markets in politically unstable countries. Foreign investors are not willing to invest in unstable countries and domestic investors generally view other investment opportunities as more valuable than stock market investment. Petrakis and Petrakis (1991) exhibit investment preference of politically unstable country investors. We can write our null hypothesis as follows:

H_o : $\mu_a=\mu_b$ the means of stock returns before and after the liberalization of the stock market are not different from each other. Our second hypothesis is that actions of foreign investors will cause a statistical change in volatility.

Table 3.17 and Table 3.19 present the descriptive statistics of the price changes before and after August 11, 1989. Forty-seven stocks have negative means before August 11, 1989. This number decreases to twenty seven stocks after that date. After August 11, 1989 twenty nine stocks have positive means. The highest standard deviation is 0.1666 (PINU) before the opening and 0.0985 (ECZ) after the opening of the market to foreigners. Prior to August 11, 1989 fifty one stocks exhibit negative skewness, with the largest number of -14.2081 (BAG). After August 11, 1989 fifty five stocks show negative skewness with the largest number of -16.3810 (ERE). The skewness numbers of some stocks increase in the second period(i.e BAG from -14.208 to -10.9078, KAR from -10.5294 to -3.569), while those of others decrease in the second period (ERE from 0.3316 to -16.3810, KOY from -1.6617 to -14.1741, SAR from -5.2282 to -13.9196). Almost all stocks are extremely leptokurtic both before and after that date.

The same pattern is observed in kurtosis. The value of AKC decreases from 142.6860 to 40.8072, similarly the kurtosis values of IZO, KAR, KAV, DOK, TSI all decrease in the second period. On the other hand, the kurtosis coefficients of ALAK, BOL, DEVA, ERE, KOCH, OLM, SAR, TSIC and YAS increase. All stocks have zero median price changes in both periods. The data do not indicate any trend in various statistics when we compare them.

TABLE 3.17
SUMMARY OF DESCRIPTIVE STATISTICS
DAILY DATA (BEFORE AUGUST 11, 1989)

	mean	std dev	skewness	kurtosis	range
Mean	-0.0024	0.0572	-3.9334	46.7328	0.6575
Number of negative observations	47	N.A.	51	0	N.A.
Number of securities with values greater than 50.00	N.A.	N.A.	N.A.	21	N.A.
Number of securities with values less than -10.00	N.A.	N.A.	2	N.A.	N.A.

Table 3.18 and 3.20 report the t statistics for the null hypothesis of population means are equal to zero. Before August 11, 1989 one stock (ERE) has mean that is statistically different from zero. We fail to reject the hypothesis for all stocks after August 11, 1989.

TABLE 3.18
SUMMARY OF T STATISTICS FOR TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS
DAILY DATA (BEFORE AUGUST 11, 1989)

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
Average	-0.5480	0.1579	0.3165
Number of significant observations rejecting equality of population means	1	N.A.	N.A.

Next the equality of the population variances is tested. Table 3.21 shows the results. The hypothesis is rejected for thirty eight stocks and the hypothesis of equal population variances is not rejected for eighteen stocks. For the following stocks the equality of the variances is rejected in two periods: AKC, ALAK, ANA, ARC, BAG, BOL, CUK, DEN, ERC, EGEB, ENK, ERE, GOOD, GUN, HEK, IZM, KEP, KOCH, KOCY, KORU, KOY, MARE, MARM, MEN, OLM, OTO, PIN, PINE, PINU, RAB, SAR, SIF, TEL, TIB, TSIC, TSKB, TUDD, YKB.

To test the hypothesis of equality of population means if the population variances are equal the t statistics is used, and the approximate t statistics is used if they are not equal. Table 3.21 presents the results. In every case, the null hypothesis of equal population means is not rejected at 5% significance level. The results of the Wald statistics also fail to reject the equality of means for all stocks.

The null hypothesis that the means of stock price changes are not different before and after the opening of the stock exchange to foreigners is not rejected. This is an expected result. When the amount of foreign investment in the stock market is examined, it is verified that foreigners did not find Istanbul Stock Market profitable. The amount of foreign investment is very little compared to the transaction volume of the exchange and moreover the net amount of investment decreased over the last two years. However, the variances are significantly different between two periods. Table 3.22 and Table 3.23 exhibit the normality test statistics values.

TABLE 3.19
SUMMARY OF DESCRIPTIVE STATISTICS
DAILY DATA (AFTER AUGUST 11, 1989)

	mean	std dev	skewness	kurtosis	range
Mean	0.0001	0.0638	-4.5482	69.4220	0.9966
Number of negative observations	27	N.A.	55	1	N.A.
Number of securities with values greater than 50.00	N.A.	N.A.	N.A.	24	N.A.
Number of securities with values less than -10.00	N.A.	N.A.	4	N.A.	N.A.

TABLE 3.20
SUMMARY OF T STATISTICS FOR TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS DAILY DATA (AFTER AUGUST 11, 1989)

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
Average	0.0744	0.0926	0.1847
Number of significant observations rejecting equality of population means	0	N.A.	N.A.

TABLE 3.21
SUMMARY TABLE FOR EQUALITY OF TWO POPULATION VARIANCES AND MEANS

	F	T	W
Number of significant observations leading to rejection of equality of variances	38	N.A.	N.A.
Number of significant observations leading to rejection of equality of means	N.A.	0	0

Both the Shapiro-Wilk statistic and the Kiefer-Salmon statistics reject normality for all stocks in both periods.

Normality tests indicate that all stocks are nonnormal in all periods.

As far as the white noise tests concerned, the Fisher's Kappa statistic rejects the hypothesis for one stock (ERE) before August 11, 1989 and fails to reject the hypothesis after August 11, 1989 for all stocks. The Bartlett's test, on the other hand, rejects the white noise hypothesis for thirty six stocks in both periods.

TABLE 3.22
SUMMARY OF TESTS FOR NORMALITY AND WHITE NOISE PROCESSES
DAILY DATA (BEFORE AUGUST 11, 1989)

	W Shapiro Wilk	KS Kiefer Salmon	κ Fisher	B Bartlett
Mean	0.7590	80,498	5.2087	0.1016
Percentage of significant observations rejecting normality	100.00	100.00	N.A.	N.A.
Percentage of significant observations rejecting white noise	N.A.	N.A.	0.01	30.25

ARCH statistic rejects homoskedasticity for 9 stocks before and 8 stocks after August 11, 1989. The BPG test rejects the hypothesis for 9 and 3 stocks and the Harvey test rejects the hypothesis for 15 and 16 stocks in the two periods respectively.

TABLE 3.23
SUMMARY OF TESTS FOR NORMALITY AND WHITE NOISE PROCESSES
DAILY DATA (AFTER AUGUST 11, 1989)

	W Shapiro Wilk	KS Kiefer Salmon	κ Fisher	B Bartlett
Mean	0.8100	352,049	5.6777	0.0630
Percentage of significant observations rejecting normality	100.00	100.00	N.A.	N.A.
Percentage of significant observations rejecting white noise	N.A.	N.A.	0	30.26

Tests for linear and nonlinear dependencies are presented in Tables 3.24 through 3.27. The Ljung Box statistic indicates linear dependencies in nine stocks before and in eight stocks after August 11, 1989. The same statistic find dependencies in squared price changes for ten stocks before and seven stocks after August 11, 1989. The Ljung Box statistic finds dependencies in absolute price changes of the majority of the stocks (thirty three out of fifty six before, and thirty eight out of fifty six stocks after August 11, 1989). Twenty four stocks exhibit significant lag one dependence before August 11, 1989 and twenty two stocks exhibit significant lag one dependence after August 11, 1989. The strict white noise hypothesis is not rejected for 22 stocks before and 14 stocks after the opening of the stock market to foreigners.

The Augmented Dickey Fuller statistics reject the unit root hypothesis for 6 stocks before August 11, 1989. The Phillips-Perron statistics reject the unit root for only 19 stocks before August 11, 1989. Both statistics indicate that majority of the stocks are nonstationarity before August 11, 1989.

TABLE 3.24
SUMMARY STATISTICS FOR TESTS OF
LINEAR AND NONLINEAR DEPENDENCE
DAILY DATA (BEFORE AUGUST 11, 1989)

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$
Mean	8.22	8.38	25.09
Number of significant observations leading to accept dependence	9	10	33

TABLE 3.25
SUMMARY STATISTICS FOR TESTS OF
LINEAR AND NONLINEAR DEPENDENCE
(AUTOCORRELATIONS)
DAILY DATA (BEFORE AUGUST 11, 1989)

	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$
Mean	0.068	0.054	0.149
Number of significant observations leading to accept dependence	24	10	42

After August 11, 1989 Augmented Dickey Fuller statistics reject the unit hypothesis for 25 stocks. However, the Phillips-Perron tests reject the hypothesis for 50 stocks in this period. This results indicate that majority of stocks become stationary after August 11, 1989. The unit root tests reinforced the previous conclusion that the opening of the market did cause a structural change in stock prices.

TABLE 3.26
SUMMARY STATISTICS FOR TESTS OF
LINEAR AND NONLINEAR DEPENDENCE
DAILY DATA (AFTER AUGUST 11, 1989)

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$
Mean	8.93	6.59	34.27
Number of significant observations leading to accept dependence	8	7	38

TABLE 3.27
SUMMARY STATISTICS FOR TESTS OF
LINEAR AND NONLINEAR DEPENDENCE
(AUTOCORRELATIONS)
DAILY DATA (AFTER AUGUST 11, 1989)

	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$
Mean	0.059	0.024	0.122
Number of significant observations leading to accept dependence	22	7	44

The tests indicate that there is no statistical difference between the population means for all stocks. The price changes are not normally distributed in both periods. For the majority of the stocks, the hypothesis of no linear dependence and no nonlinear dependence in squared series are not rejected. On the other hand, majority of the stocks exhibit dependencies in the absolute price changes in both periods.

The previous findings indicate that opening of the stock market cause a structural change (not in the mean, but in the variance). In summary the hypothesis that liberalization in the stock market did not cause a change in means of stock prices is not rejected. However, this process cause a structural change in the variance of the stock prices. Moreover the unit root tests also indicate a structural change in stock prices after August 11, 1989.

CHAPTER 4

DIVERSIFICATION AND EFFECTIVE PORTFOLIO FORMATION

In general developing equity markets have fewer number of securities listed than developed markets. Moreover, the majority of companies are related to one another through main holding corporations. Because of this circumstance, some researchers (Solnik (1975), Grubel (1968)) advise international diversification, especially for investors in small equity markets. Effective portfolio diversification is more limited in developing and small exchanges relative to the developed ones. In Chapter Four, the diversification question is investigated and portfolios and effective risk diversification in the Istanbul Stock Market are examined.

First the relevant literature is reviewed. In part B data and the methodology is presented. In part C, the results are presented and discussed.

4.A. LITERATURE REVIEW

Markowitz (1959) states that a good portfolio is more than a long list of good stocks and bonds; rather it is a balanced whole, providing investors with protections and opportunities with respect to a wide range of contingencies. Investors are assumed to prefer return and dislike risk. That is, they try to create a diversified portfolio which minimizes risk for a given expected return. Since securities are correlated among themselves it is impossible to eliminate all risk. However, if securities are randomly chosen it is possible to further reduce risk by adding more securities to a portfolio. Unfortunately, it is very costly to create and maintain a portfolio consisting of large number of stocks. If we continue adding stocks to a portfolio there comes a point at which costs of diversification exceed benefits of diversification.

Markowitz's (1959) definition of an efficient portfolio loses its meaning in the case that the distribution of price changes has infinite variance. If returns follow stable Paretian distribution with infinite variances, portfolio analysis and diversification studies should use measures of dispersion other than variance. Fama (1965b) addresses diversification problem when returns follow stable Paretian distribution. The author uses Sharpe's technique and develops a portfolio analysis model. He shows that the scale parameter is appropriate as a measure of dispersion for stable Paretian distributions. However, diversification makes sense only for certain values of α parameter of distributions. If $\alpha>1$ then increased diversification is effective in reducing the dispersion of the return distribution. When $\alpha<1$, increasing diversification causes the dispersion of the return to increase and when $\alpha=1$ diversification is not effective. The author suggests portfolio formation and diversification to American investors, because of the fact that for most American companies, α is between 1.7 and 1.9 according to his previous research. However, the author admits that statistical theory of stable Paretian distributions are not developed satisfactorily to use his theoretical model.

Frankfurter and Lamoureux (1987) compare the Sharpe diagonal model to Fama's (1965b) model. Sharpe's diagonal model assumes that stock returns follow normal distributions. Fama's model is on the other based on stable Paretian distribution. Frankfurter and Lamoureux (1987) simulate normal and stable Paretian distributions. Then they form portfolios under both conditions. The authors show that the investor will do better if he assumes that the actual environment does explain returns. However, the gain from assuming stable Paretian distribution-when the world is stable is not significant at 5% level. On the other hand, the assumption of normality provides significantly better portfolios when the world is normal. The authors show that stable Paretian assumption never significantly outperforms the normal assumption regardless of the true state of the world. They conclude that since the true state of the world is not known, it is better for portfolio managers to assume normality.

How many stocks are needed to form a diversified portfolio? The risk of a portfolio depends on the variance of the individual securities, the correlations among them and the fraction of each stock in the portfolio. However, it is generally true that in an equally weighted portfolio of randomly selected stocks, as the number of stocks increases the variance of the portfolio decreases until a limit is reached.

All of the following studies of portfolio diversification assumes normality. Evans and Archer (1968) compute the return and standard deviation of portfolios consisting of increasing number of randomly chosen securities. Their results show that the average standard deviation decreases to an asymptote approximating the level of systematic variation in the market, and much of the unsystematic variation is eliminated by the time the 8^{th} security is added to the portfolio. They conclude that there is no economic justification of increasing portfolio sizes beyond 10 or more securities.

Wagner and Lau (1971) examine the relationship between risk and return of portfolios consisting of equal holdings in all stocks on the New York Stock Exchange. They calculate the standard deviation of different size portfolios based on monthly returns. According to their results 40 percent of the risk is reduced by the time 20^{th} security is added to the portfolio. They argue that investors can improve the performance of their portfolios by expanding the list of qualified securities to include high return high risk stocks, while offsetting the increase in market risk through more effective diversification.

Fama (1976) chooses 50 stocks randomly from the securities listed on the New York Stock Exchange and forms equally weighted portfolios using these stocks. He measures the standard deviation of these portfolios on monthly data from 1963 to 1968. Fama reports that most of the diversification is obtained after the first 10 to 15 securities are added to the portfolio and that after the 15th security the portfolio standard deviation approaches to average covariance of all securities.

Evans and Archer (1968) measure risk by the dispersion of a portfolio return around the mean return of that portfolio. Elton and Gruber (1977) derive an analytical expression for the relationship between portfolio size and risk. They claim that the earlier studies defined risk improperly. Elton and Gruber argue that the risk associated with the probability that the mean return on the portfolio will be different from the return in the market is neglected by the previous studies. They then derive the analytical formulas not only for the expected value of variance of a portfolio but also for the variance in the variance. The authors also derive the variance formulas using the single index model of Sharpe (1964). They examine the results obtained from both formulas using weekly returns from securities selected from New York and American Stock Exchanges. Their results show that the single index approximation is reasonably accurate in estimating the expected variance or total risk, but is much less accurate in estimating variance in variance.

Elton and Gruber then calculate the expected portfolio variances of different size portfolios. Table 4.1 shows their results. A summary of their findings is as follows: the expected portfolio variance of a single security is 46.619%. The variance of the portfolio with 10 securities is 11.033%, one fourth that of a single security. The minimum risk is 7.07%. It takes a portfolio of 28 securities to obtain a portfolio with a 20% risk higher than that of the minimum risk. The authors conclude that the gains in decreased risk from adding stocks beyond 15 is significant.

The studies that we investigated failed to distinguish between lending and borrowing investors. Statman (1987) examines portfolio diversification for two different class of investors: those that are borrowing and those that are lending. He concludes that a well diversified portfolio must include at least 30 stocks for a borrowing investor and 40 stocks for a lending investor.

Ibbotson and Sinquefield (1976) study the effect of diversification on the portfolios formed of different type of assets. Their results show that if assets are not chosen randomly (e.g portfolios of small stocks) diversification is not achieved by adding more securities.

International diversification is first examined by Grubel (1968) with the market index portfolios of eleven countries. He concludes that investors can gain up to 68% extra return for the same level of variance if they diversify their portfolios internationally.

TABLE 4.1
EFFECT OF DIVERSIFICATION

Number of Securities	Portfolio Variance (%)
1	46.619
2	26.839
4	16.948
6	13.651
8	12.003
10	11.014
12	10.354
14	9.883
16	9.530
18	9.256
20	9.036
25	8.640
30	8.376
50	7.849
100	7.453
1000	7.097
Infinity	7.070

Source: Modern Portfolio Theory and Investment Analysis by Elton and Gruber (1987) page 31

Levy and Sarnat (1970) present estimates of the potential gains from international diversification for the period 1951-1967. The authors examine the annual rates of returns for the following 28 countries: Australia, Austria, Belgium, Canada, Ceylon, Chile, Denmark, Finland, France, Germany, India, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Peru, Philippines, Portugal, South Africa, Spain, Sweden, Switzerland, United Kingdom, United States and Venezuela. They calculate the efficiency frontier which consists of the portfolios that either maximizes the rate of return given the variance, or minimizes the variance given the rate of return. Although twenty eight countries are examined, only nine countries are included in at least one of the optimal portfolios. Investments in the United States and Japan account for a majority of the optimal portfolios. In these portfolios the percentages of developing country stocks are very high. They conclude that gains from international diversification is substantial for the investors and the inclusion of developing countries in portfolios improves gains even further.

Solnik (1975) examines international diversification with the data that consist of weekly price movements of three hundred stocks from European countries (United Kingdom, Germany, France, Switzerland, Italy, Belgium and the Netherlands). He constructs portfolios with an increasing number of different stocks. As diversification increases, the risk of a portfolio decreases in all countries (but not proportionally). [11] Even with a very large number of stocks portfolio risk can be diversified away only to a limit, because the rate of return on any portfolio is highly correlated with that of the market as a whole. For U.S.

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[11] In this study, risk is measured by the variance of portfolio returns expressed as a percentage of the variance of the return of a typical share of that country.

stocks the percentage of diversification is 73% whereas for Italian and Swiss stocks this percentage is as low as 56%. If a portfolio is formed by combining U.S stocks with European stocks, 89.3% of risk can be diversified away. Solnik concludes that most American firms publicly offer common stock while a big proportion of European firms are still privately owned, even the largest firms. Therefore, European investors do not get the same diversity of stocks to choose from. Thus international diversification is relatively more attractive to European investors then to domestic investors in the U.S. International diversification is especially useful for the investors of certain countries such as Italy with low percentages of risk diversification.

Philippatos, Christofi and Christofi (1983) study the correlations among the 14 countries. The results of the principal component analysis indicate that there exists three international economic factors that contribute to the stability of the intertemporal relationships. These results are consistent with those of other studies that find gains from international diversification.

Eun and Resnick (1987) evaluate the actual and potential gains from international diversification from the viewpoint of fifteen national investors under flexible exchange rates. Their results indicate that despite the adverse effect of fluctuating exchange rates, every national investor benefits from international diversification. The actual gains accruing from a particular investment strategy is lower than the potential gains.

The results of Poon, Taylor and Ward (1992) show that for the U.K market the risk of portfolios decrease significantly by increasing the number of stocks in a portfolio beyond ten. Their study covers five subperiods. The risk reductions by increasing the number of securities from 10 to 25 are 25.84%, 31.11%, 23.02%, 14.49% and 15.84% for the five subperiods.

The common conclusions of all these papers suggest that the merits of international diversification stem from the interdependence of international equity markets and the low correlation that exists between national stock markets.

The comovement of world stock indexes are examined by Agmon (1974), Granger and Morgenstein (1970). They find no significant lead and lags among developed stock exchanges. Hilliard (1979) examines the structure of international equity market indexes during the OPEC embargo. He finds no common worldwide financial market factor. Most intracontinental prices move simultaneously. Most intercontinental prices are not closely related. His results of low correlations among international markets support the previous studies.

The intertemporal stability of international stock markets is studied by Maldonado and Saunders (1981). They hypothesize that the correlation matrix of international returns is unstable and therefore it is not possible to obtain substantial gains from international diversification. Using the data of Japanese, German, Canadian, British and U.S. market correlations they fail to reject the null hypothesis that correlations follow a random walk. They conclude that beyond two quarters, intercountry correlations are generally unstable and the potential size of the gains from international portfolio investment is overstated for the U.S. investors.

Panton, Lessig and Joy (1976) employ cluster analysis to examine twelve stock market indexes. Their results support the existence of strong stability for one year and three year periods. The results of Philippatos, Christofi and Christofi (1983) agree with those of Panton, Lessig and Joy and support the hypothesis of a stable structure in the intertemporal relationships among national stock market indexes of the industrialized world. Philippatos, Christofi and Christofi (1983) conclude that the results of earlier studies on ex ante gains from international diversification cannot be questioned on the grounds that the sufficient conditions are not met.

Recently researchers focus their attention on the interdependencies among stock markets. Schollhammer and Sand (1985) find significant positive correlations between intercontinental as well as intracontinental equity market indexes. The U.S. equity market leads the other markets by one day. The considerable comovement among national stock market indexes indicates that international diversification is not very profitable. However, the authors find low correlation coefficients among markets.

Eun and Shim (1989) estimate a nine market vector autoregressive system using daily rates of return on the stock market indexes from the period January 1980 through December 1985. Their results show that significant interaction exists among national markets. The U.S. market is the most influential in the world. The Japanese market appear to act like a follower in international stock markets. All the European and Asian markets respond with one or two day lag to U.S. market innovations. At the 20 day horizon, innovations in foreign markets collectively account for 26 percent of the error variance of a national stock market on the average.

Koch and Koch (1991) investigate the contemporaneous and lead-lag relationships across national equity markets over three different years: 1972, 1980 and 1987. They find that international markets have recently grown more interdependent. Most of the significant same day correlations appear within blocks of countries in the same geographic region. Generally markets adjust to new information with one day lag. Over the years the Japanese market has grown to be more of a market leader, while the U.S. market's influence has waned.

Kasa (1992) investigates common stochastic trends in the equity markets of the U.S., Japan, England, Germany and Canada. He finds a single common trend driving these stock markets. This indicates that there are no long term gains to international diversification. However, he also indicates that national stock markets can deviate from this trend for periods lasting several years.

Hamao, Masulis and Ng (1990) examine the transmission mechanisms of the conditional first and second moments across international stock markets over the three year period, 1985 to 1988. The authors study daily open and close data from Tokyo, London and New York market. They find large positive correlations between contemporaneous Tokyo and London returns, London and New York returns and lagged New York and Tokyo returns. The authors then model the returns of all the stock exchanges with GARCH (1,1)-M model. Then they examine the volatility spillover effect from the previously open foreign stock market into the domestic stock market. For the whole period the effect of a volatility surprise of the most recent foreign market on the return volatility of the domestic market is statistically significant for all three stock exchanges. However, when the post October 1987 period is removed from the sample, only in one of the three markets is a statistically significant volatility spillover effect observed, from the United States to Japan. For the conditional variance they find spillover effects from the U.S. and the U.K. stock markets to the Japanese market.

Malliaris and Urrutia (1992) analyze lead-lag relationships for six stock market indexes for time periods before, during and after the October 1987 market crash. For the pre crash and post crash periods they do not find significant lead-lag relationships. Their causality tests make them believe that the crash probably started simultaneously in all the stock markets.

The Istanbul Stock Market is dominated by 3 or 4 big family owned corporations and state owned companies. Their influence on the index is so pervasive that it is open to question whether Turkish investors can diversify effectively by forming portfolios of 15-20 stocks or even 30 Turkish stocks.

4.B. DATA AND METHODOLOGY

According to the results of unit root tests of Chapter 3, some stocks have unit roots and others do not have unit roots(they are stationary). For the stocks with unit roots the unexpected price changes are used. The unexpected price changes are estimated using the following equation.

$$\varepsilon_t = Y_t - Y_{t-1}$$

where ϵ_t: unexpected price change.

The unexpected prices are used for the stationary stocks. The lag orders are chosen as the highest significant lag from the autocorrelation function of each stock.

$$Y_t=\alpha_o+\sum_{j=1}^{p}\gamma_j Y_{t-j}+\varepsilon_t$$

The diversification question is investigated first by using the daily data for the whole period. Then the same analysis is repeated with data that are obtained before and after August 11, 1989.

Since the true state of the world or the true distribution of stock returns is unknown, Frankfurter and Lamoureux's (1988) suggestions are employed and normality is assumed. Under this assumption the variance of a portfolio of assets is

$$\sigma_p^2=\sum_{i=1}^{N} X_i^2\sigma_i^2+\sum_{i=1}^{N}\sum_{j=1,i\neq j}^{N} X_iX_j\sigma_{ij}$$

σ_i^2: *variance of asset i,* σ_{ij}:*covariance of assets i,j*

For equal investment the formula reduces to the following:

$$\sigma_p^2=\frac{1}{N}\sum_{i=1}^{N}\left[\frac{\sigma_i^2}{N}\right]+\frac{(N-1)}{N}\sum_{i=1}^{N}\sum_{j=1,i\neq j}^{n}\left[\frac{\sigma_{ij}}{N(N-1)}\right]$$

$$\sigma_p^2=\frac{1}{N}\overline{\sigma}_J^2+\frac{N-1}{N}\overline{\sigma}_{ij}$$

where $\overline{\sigma}_j^2$=*average variance* $\overline{\sigma}_{i,j}$=*average covariance*

The portfolios of increasing numbers of randomly chosen securities are formed and their variances are calculated using the previous formula. This process produces 30 portfolios ranging in size from 1 to 30 securities. Then this step is repeated 20 times and 20 random samples are obtained for each portfolio. The average variance of these random samples are used as the variance of different size portfolios. The variances of the portfolios composed of different number of Turkish stocks and also the number of securities with which idiosyncratic risk is diversified are reported.

Secondly, the methodology of principal components is applied in order to examine the number of common factors in stock prices. A principal component analysis is concerned with explaining the variance-covariance structure through a few linear combinations of the original variables. Although p components are required to reproduce the total system variability, often much of this variability can be accounted for by a small number, k, of the principal components. If so, there is almost as much information in the k components as there is in the original p variables. The k principal components can then replace the initial p variables, and the original data set, consisting of n measurements on k principal components.

If the random vector $X'=[X_1, X_2, \ldots\ldots, X_p]$ has the covariance matrix Σ with eigenvectors $\lambda_1 > \lambda_2 > \ldots\ldots\ldots > \lambda_p > 0$, then i th principal component is given by: $Y_i = e_i'X$

where e_i'= eigenvalue.

The first principal component is the linear combination with maximum variance. The total variance = $\lambda_1 + \ldots\ldots\ldots + \lambda_p$.

$$\text{Proportion of variance due } k^{th} \text{ factor} = \frac{\lambda_k}{\lambda_1 + \lambda_2 + \ldots\ldots + \lambda_p}$$

In this part of the chapter the price change data and price data of the Turkish stocks are exploited, the covariance-variance matrix is found. Then the principal component analysis is used to discover whether the variability in the system can be explained with n mutual funds or n factors.

4.C. RESULTS AND DISCUSSION

1. Diversification through portfolio formation

Table 4.2 shows the variances of the portfolios with different number of securities. The average stock variance is 58.800%. For portfolios of size 15, the average variance is 10.534% which corresponds to 17.92% risk. Examining Figure 4.1 shows that with fifteen securities 82.08% of the variance of the unexpected price changes is diversified away.

Next portfolios with 56 assets that were listed before August 11, 1989 are formed. Table 4.3 and Figure 4.2 show the variances of the portfolios and the effect of diversification in period Jan 4, 1988 through August 11, 1989. The average variance is 42.192% in this period. The variance of the ten security portfolio is 8.871%.

Table 4.4 and Figure 4.3 exhibit the results for the period between August 11, 1989 through July 31,1992. The average variance is 48.455%. The variance falls to a number of 10.408% for portfolios with ten securities.

TABLE 4.2
EFFECT OF DIVERSIFICATION
DAILY DATA

Number of Securities	Portfolio Variance (%)
1	58.800
2	49.931
3	29.569
4	21.528
5	15.841
8	13.838
10	12.010
15	10.534
20	9.296
25	8.012
30	7.216

In both periods most of the diversification is obtained with portfolios that consist of ten securities. These portfolios have 21.02% and 21.48% of the risk of the average security in two corresponding periods.

The results agree with those of Fama (1976) that most of the diversification is obtained with 10-15 security portfolios. When diversifications before and after August 11, 1989 are compared, it is observed that before August 11, 1989 with 10 security portfolio an investor can diversify 78.98% of the variance. Whereas he can only diversify 78.52% of the variance after August 11, 1989. The results indicate that effective diversification is possible in Turkish market

TABLE 4.3
EFFECT OF DIVERSIFICATION (BEFORE AUGUST 11,1989)
DAILY DATA

Number of Securities	Portfolio Variance (%)
1	42.192
2	29.920
3	21.637
4	14.052
5	12.035
8	10.445
10	8.871
15	8.777
20	7.203
25	7.013
30	7.005

TABLE 4.4
EFFECT OF DIVERSIFICATION (AFTER AUGUST 11,1989)
DAILY DATA

Number of Securities	Portfolio Variance (%)
1	48.455
2	32.496
3	19.616
4	17.553
5	13.636
8	11.867
10	10.408
15	9.653
20	8.332
25	8.213
30	7.821

and Turkish investors need not diversify internationally to get 80% diversification. They also verify the results of Chapter 3 that after the opening of the market to foreign investors, significant variance changes occurred.

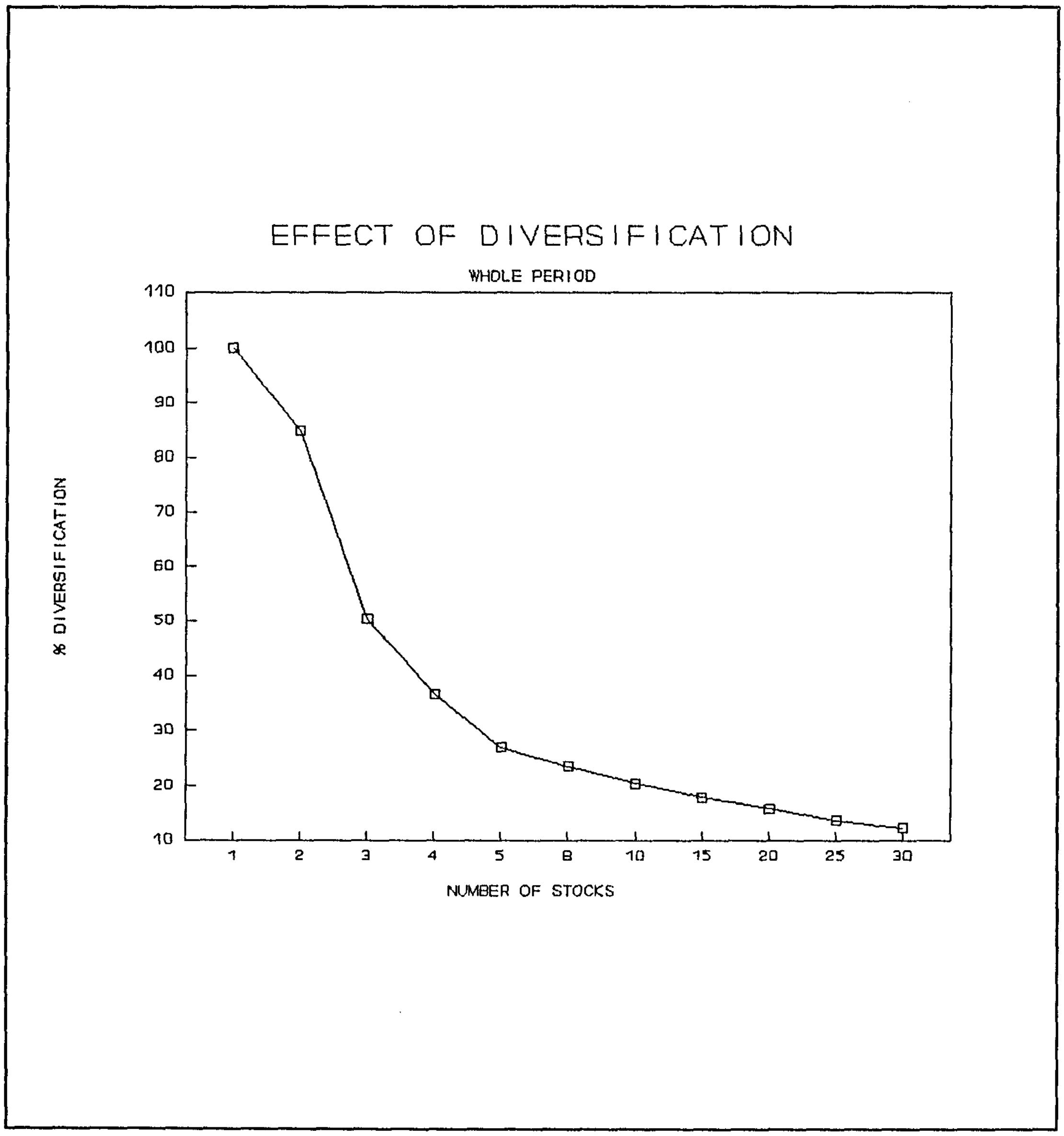

FIGURE 4.1
EFFECT OF DIVERSIFICATION
DAILY DATA

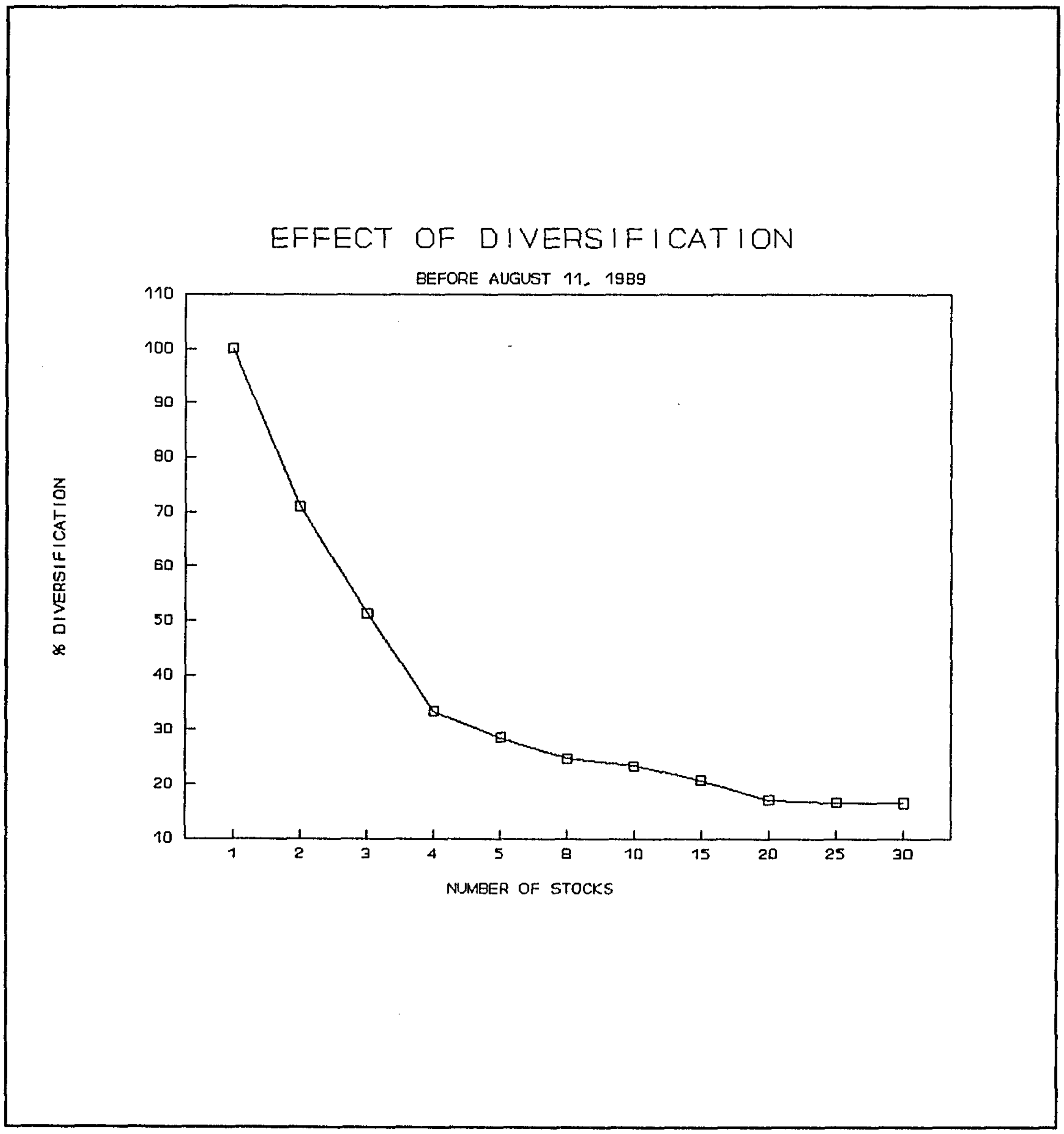

FIGURE 4.2
EFFECT OF DIVERSIFICATION
DAILY DATA (BEFORE AUGUST 11,1989)

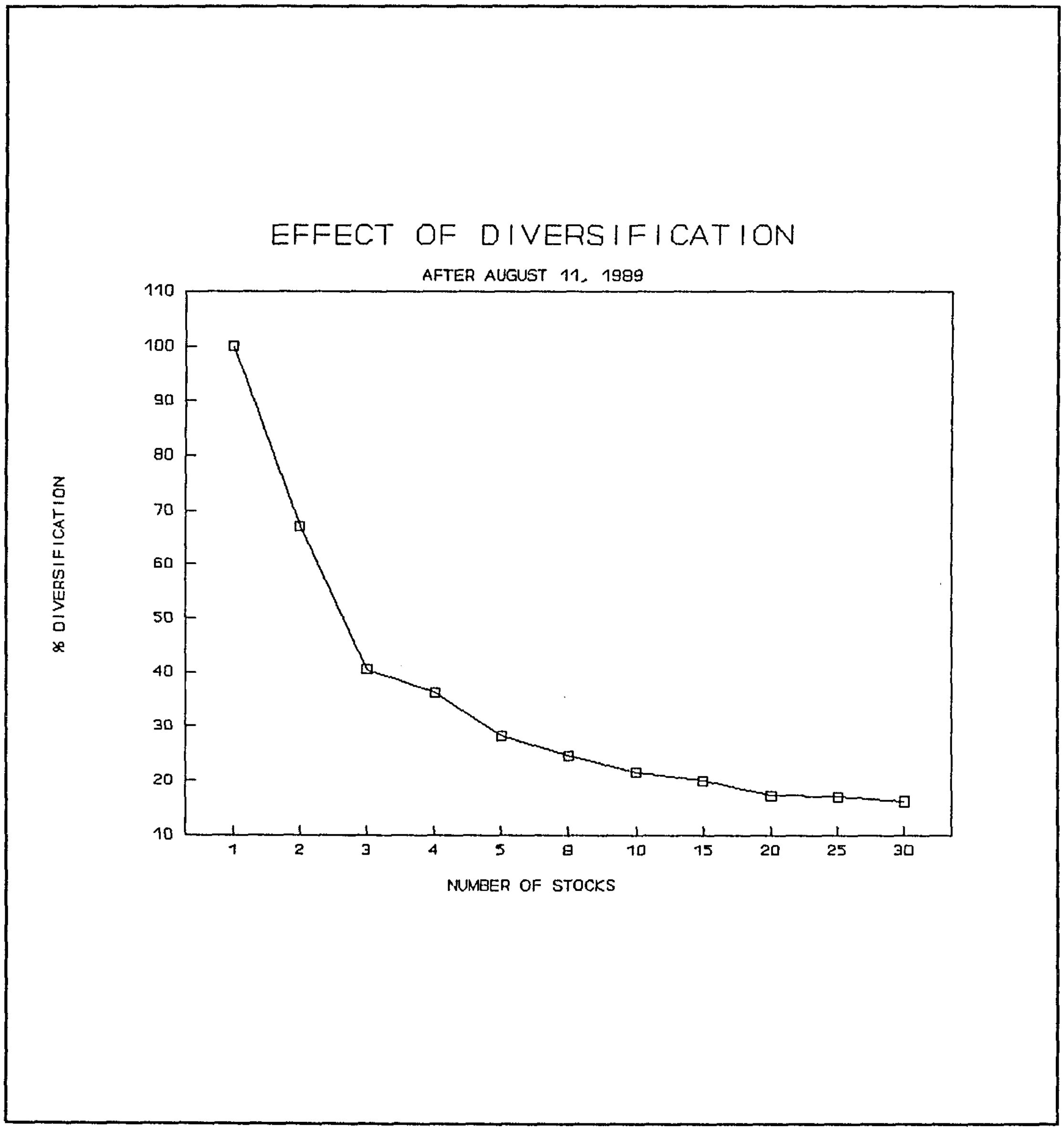

FIGURE 4.3
EFFECT OF DIVERSIFICATION
DAILY DATA (AFTER AUGUST 11,1989)

2. Principal component analysis

The results of the principal component analysis are presented in Tables 4.5, 4.6 and 4.7.

If the daily data for the whole period between January 3, 1988 through July 31, 1992 are used and the covariance-variance matrix is analyzed using the principal component analysis the principal components listed on the Table 4.5 are obtained. The first principal component explains 28.37% of the variance. Fifteen principal components explain 72.33% of the variance.

TABLE 4.5
RESULTS OF THE PRINCIPAL COMPONENT ANALYSIS
DAILY DATA

Factor Number	Cumulative Variance Explained (%)
1	28.37
2	40.82
3	50.81
4	53.93
5	56.61
6	58.92
7	61.07
8	62.92
9	64.64
10	66.24
11	67.67
12	69.07
13	70.23
14	71.33
15	72.33

The cumulative variance explained by fifteen principal components is 91.89% when only those prices and price changes that occurred before August 11, 1989 are concerned. This figure is 61.06% for the period after August 11, 1989. The first principal component explains only 22.59% between August 11, 1989 and July 31, 1992 versus 47.36% between January 3, 1988 and August 11, 1989.

TABLE 4.6
RESULTS OF THE PRINCIPAL COMPONENT ANALYSIS
DAILY DATA (BEFORE AUGUST 11, 1989)

Factor Number	Cumulative Variance Explained (%)
1	47.36
2	56.43
3	63.80
4	68.34
5	72.49
6	75.72
7	78.38
8	80.94
9	82.97
10	84.94
11	86.68
12	88.16
13	89.53
14	90.79
15	91.89

TABLE 4.7
RESULTS OF THE PRINCIPAL COMPONENT ANALYSIS
DAILY DATA (AFTER AUGUST 11,1989)

Factor Number	Cumulative Variance Explained (%)
1	22.59
2	29.89
3	33.41
4	36.57
5	39.60
6	42.55
7	45.07
8	47.43
9	49.67
10	51.82
11	53.84
12	55.78
13	57.66
14	59.36
15	61.06

The results of the principal component analysis verify the previous findings that variances before and after August 11, 1989, changed significantly and that more factors are needed to diversify effectively after August 11, 1989.

CHAPTER 5

CONCLUSION

On January 24, 1980 Turgut Ozal, the minister of economic affairs, made an announcement of an economic decree that began the liberalization of the Turkish economy. The primary objectives of this decree can be summarized as follows: 1. The administration will take measures to promote export trading. 2. The exchange rate system will be floating rather than the fixed rate system that was used in the past. 3. The administration will reduce its intervention in the markets. Interest rates will be determined by market forces.

Among these liberalization activities was the opening of the stock exchange with new rules and regulations. At this time, both the British and U.S. administrations, the World Bank and the IMF encouraged the Turkish government to open the stock exchange. Mr Ozal, who worked for IMF for four years, was influenced by IMF policies and became convinced that the only way to improve the Turkish economy was to go through this liberalization process. Before the opening of the stock exchange, the companies were overdependent on commercial banks for their capital requirements. The authorities cited two main reasons to open the stock market: 1. to provide alternative sources of capital, 2. to provide the public new sources of investment. The authorities also wanted to provide incentives for idle funds that were invested in gold to be channeled into productive investments.

The Istanbul Stock Exchange was established on January 2, 1986. The Istanbul Stock Exchange, being one of the newest stock exchanges in the world, has not been investigated in a comprehensive way.

In this dissertation first the institutional characteristics of the Istanbul Stock Exchange are examined. The aim is to introduce the reader to the history, the trading system, the rules, and the organization of the Istanbul Stock Exchange. Next, the comparative statistics for the Istanbul Stock Exchange Index and those of other emerging exchanges are provided. Then some problems of the exchange are discussed and measures intended to improve the efficiency and the effectiveness of the exchange are suggested.

In Chapter 3, the price changes of 119 stocks between January 4, 1988 and July 31, 1992 are examined. The data are investigated in three periods: 1. Before August 11, 1989 at which the stock exchange was opened to foreign investors. 2. Between August 11, 1989 and July 31, 1992. 3. The whole period between Jan 4, 1988 and July 31, 1992. The basic statistics are provided and the normality of the data is checked. For all three periods normality and strict white noise processes are rejected. Turkish stocks are nonnormal and heavily leptokurtic, similar to those in the U.S. and stocks in other market stocks. Both linear dependence and dependence in the squared series are rejected. But dependence in the absolute value series is not rejected.

Then the stock distributions before and after August 11, 1989 are compared and the hypothesis that the means of the first two periods are equal is not rejected. However, the hypothesis that variances of the two period are equal is rejected. It is concluded that the August 11, 1989 Decree caused significant variance changes.

In Chapter 4, risk reduction via portfolio formation within the Istanbul Stock Exchange is examined. The results indicate that it is possible to diversify effectively by forming portfolios of 15-20 stocks. When risk reduction before and after August 11, 1989 is compared, it is found that after August 11, 1989 it is necessary to increase number of stocks in portfolios to achieve the same level of risk reduction as can be achieved before August 11, 1989. This result supports the previous finding that after August 11, 1989 stock variances changed significantly.

The greatest difficulty in studying emerging markets is the limited availability of data. The Turkish stock market is no exception. The Istanbul Stock Exchange provided the price data for stocks. However, the exchange does not have dividend and rights issue offerings information. In the future after this data is obtained, returns will be calculated and the analysis will be repeated with return data. Once the return data is obtained it will be possible to model the data series. With return data, both nonlinear conditional heteroskedastic models and mixtures of distributions can be employed to fit the data. Secondly, this analysis will be extended to at least 10 years of data to substantiate the conclusions.

In the future, the policies of the State Economic Enterprise privatization committee could be investigated. One study might investigate whether or not privatized stocks are underpriced as are initial public offerings in the U.S. Another study could examine the effects of announcements of the committee on stock returns. This dissertation provides a foundation for future studies of not only Turkish stock market, but also of other new emerging stock exchanges.

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APPENDIX

DETAILED TABLES

TABLE A.1
DAILY DATA
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
AAA	-0.0085	0.2109	-17.2722	320.0253	4.4452
AAC	-0.0081	0.2008	-14.1132	260.4965	4.7141
ABA	-0.0039	0.0434	0.0043	0.4293	0.2371
AFC	0.0022	0.0506	0.2157	-0.1575	0.2427
AKA	0.0007	0.0521	0.1194	-0.1317	0.3275
AKB	-0.0034	0.0399	-3.4031	42.6330	0.6262
AKC	-0.0016	0.0607	-8.1795	142.7691	1.2970
AKS	0.0006	0.0517	-0.0934	0.4231	0.3457
ALAK	0.0022	0.0749	-8.0601	128.1658	1.4362
ALAS	-0.0030	0.0447	-0.0346	0.6606	0.2350
ALTY	-0.0016	0.0209	0.2265	4.3224	0.1769
ANA	-0.0005	0.0543	-1.9139	19.0488	0.7762
ARC	0.0001	0.0623	-6.8243	84.7179	1.0123
ASEL	-0.0009	0.0492	0.1368	0.2807	0.2818
AYG	0.0006	0.0739	-7.1944	92.9673	1.1705
BAG	-0.0020	0.0803	-13.5093	271.1723	1.9054
BOL	-0.0022	0.0770	-9.7499	152.7824	1.4627
BRI	-0.0008	0.0581	-4.3804	58.3343	0.9889
CAN	0.0013	0.0749	-4.2828	58.3179	1.2672
CEL	-0.0010	0.0574	-5.4323	63.5923	0.8783
CIMS	-0.0009	0.0578	-4.7925	63.9558	1.0320
CUK	-0.0006	0.0582	-5.7697	69.8709	1.0547
DEM	-0.0037	0.0473	-3.5506	26.3969	0.5288
DEN	-0.0015	0.0642	-2.6672	32.6082	1.0245
DEVA	0.0010	0.0780	-9.7065	167.9269	1.6331
DOG	-0.0045	0.0706	-4.9907	65.2331	1.1343
DOK	-0.0006	0.0637	-5.8004	72.0426	1.0222
ECZ	0.0003	0.0853	-7.7229	133.9994	2.3208
ECZI	-0.0042	0.0775	-8.0483	101.2669	1.2090
EGEB	0.0039	0.0527	-7.0086	139.2659	1.1808
EGEE	-0.0021	0.0956	-9.3360	130.4919	1.5685
EGEG	-0.0023	0.0640	-5.7981	86.3834	1.1408
EMEK	-0.0026	0.0536	-2.6780	22.2181	0.5914
ENK	0.0008	0.0694	-3.0237	24.0612	0.8212
ERC	0.0038	0.0737	-7.1209	103.8423	1.2059
ERE	-0.0001	0.0756	-17.2599	452.1732	2.2821
FIN	-0.0042	0.0648	-7.3428	88.2449	1.0081
GEN	-0.0025	0.0726	-6.2977	80.8983	1.1628
GOOD	-0.0006	0.0585	-4.0887	50.1120	0.9006
GOR	0.0006	0.0822	6.1787	90.1148	1.4617
GUB	-0.0013	0.0461	-0.1779	0.6772	0.3365
GUN	0.0030	0.0514	-2.4746	32.3372	0.8266

(table con'd)

TABLE A.1
DAILY DATA
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
HEK	-0.0011	0.0572	-3.5389	38.6940	0.8450
HURG	-0.0124	0.0878	-5.3919	44.1901	0.8390
IKT	-0.0005	0.0498	-0.5081	3.3807	0.4979
INT	-0.0006	0.0735	-5.3625	59.2543	1.0869
ISM	-0.0063	0.0721	-3.2584	22.9229	0.7234
IZM	-0.0014	0.0610	-3.2151	40.9457	1.0172
IZO	-0.0001	0.0649	-6.4448	85.1861	1.1326
KAR	-0.0011	0.0528	-5.7715	82.6678	0.9563
KAV	-0.0022	0.0671	-5.9107	69.9599	1.0599
KEL	-0.0035	0.0649	-3.6778	40.5620	0.8898
KEN	-0.0052	0.0998	-14.8348	235.5555	1.6740
KEP	-0.0009	0.0599	-3.8636	44.5805	1.0839
KOCH	0.0002	0.0614	-7.0655	106.6190	1.2250
KOCY	0.0008	0.0537	-4.4284	50.6828	0.9119
KON	0.0018	0.0467	-0.1134	1.5282	0.3725
KORD	-0.0011	0.0495	-2.7341	22.9801	0.6310
KORU	-0.0015	0.0603	-7.9931	160.7606	1.4276
KOY	-0.0002	0.0859	-14.5222	331.6652	2.0996
KUT	0.0003	0.0525	0.0328	-0.2245	0.2671
MAK	-0.0029	0.0778	-6.8862	91.6330	1.2092
MARE	0.0004	0.0558	-1.5279	12.9984	0.7007
MARM	-0.0003	0.0484	0.2774	3.1139	0.5860
MARMA	-0.0011	0.0586	-1.9227	18.2878	0.7447
MBV	-0.0016	0.0592	-4.3250	52.7635	0.8655
MEN	-0.0017	0.0762	-6.9512	92.0542	1.2186
MIG	0.0033	0.0681	-8.7193	126.6418	1.1265
NAS	-0.0016	0.0605	-2.1577	25.3158	0.9418
NET	-0.0015	0.0567	-1.9088	15.5390	0.7093
NETH	-0.0024	0.0592	-1.7853	15.1319	0.7238
NETT	-0.0048	0.1660	-9.4045	101.4398	2.1000
NIG	-0.0003	0.0627	-1.7781	13.4827	0.6311
OKAN	-0.0014	0.0641	-0.8485	5.4311	0.6783
OLM	-0.0024	0.0649	-6.8466	124.0761	1.3871
OTO	0.0009	0.0513	-1.4300	10.5588	0.5718
PAR	-0.0062	0.0724	-3.8459	39.6773	0.9828
PEG	-0.0019	0.0507	-1.6435	12.6185	0.5468
PET	-0.0026	0.0502	-1.5130	15.6979	0.6154
PETR	-0.0028	0.0543	0.0852	0.2080	0.2766
PIN	-0.0003	0.0574	-3.5657	49.4613	1.0111
PINE	-0.0004	0.0543	-0.5597	3.1945	0.5227
PINSU	-0.0003	0.0581	-0.0228	0.3839	0.4756
PINU	0.0036	0.0597	-0.0651	-0.5890	0.2507
PMA	-0.0004	0.0609	-0.7243	3.1781	0.5658
POAS	0.0013	0.0456	-0.0691	-0.0747	0.2244
RAB	-0.0015	0.0589	-4.5618	69.1336	1.3196

(table con'd)

TABLE A.1
DAILY DATA
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
SANT	-0.0055	0.1343	-13.7031	226.8872	2.4970
SAR	0.0003	0.0639	-13.1474	305.9347	1.6602
SIF	-0.0016	0.0676	-3.4586	34.3830	0.9667
SKS	-0.0028	0.0708	-2.9685	30.3272	0.9933
SON	-0.0008	0.0219	-1.2218	5.5237	0.1734
SUNE	-0.0027	0.0720	-5.3580	62.6549	1.0153
TAMSI	-0.0011	0.0495	-0.2711	1.0539	0.3690
TDT	-0.0042	0.0626	-1.6590	15.2253	0.7801
TEL	0.0007	0.0530	-5.0259	84.2965	1.1553
TGAR	-0.0025	0.0567	-4.3773	48.1666	0.7938
TIB	0.0003	0.0532	-1.7926	16.5879	0.7061
TIR	-0.0000	0.0611	-0.0611	0.2238	0.3101
TKB	-0.0036	0.0503	-2.8424	29.5167	0.6650
TOF	-0.0033	0.0831	-5.0586	49.3399	1.0411
TOFO	0.0022	0.0591	-0.9571	6.2387	0.5318
TRK	-0.0020	0.0483	-1.6060	15.6516	0.5576
TSI	-0.0009	0.0638	-5.5205	69.4954	0.9970
TSIC	-0.0010	0.0627	-6.9321	121.9204	1.3330
TSKB	0.0000	0.0543	-0.5894	2.6418	0.4418
TUDD	0.0001	0.0547	-3.6925	39.0880	0.7975
TURP	0.0034	0.0524	0.0863	-0.4606	0.2488
TURY	-0.0042	0.0696	-1.2755	15.8694	0.9808
TUTU	0.0013	0.0552	-0.1243	-0.0940	0.2746
TUYT	-0.0009	0.0520	-4.5351	41.5584	0.6376
UNYE	-0.0025	0.0640	-4.4603	45.9633	0.8374
USS	-0.0033	0.0777	-6.8043	97.6148	1.3024
VAKY	-0.0006	0.0542	0.0158	0.3445	0.3307
VES	-0.0050	0.0563	-2.9143	32.5676	0.8071
VKL	-0.0063	0.0761	-6.7909	74.4490	1.0376
YAS	-0.0002	0.0576	-3.4758	39.6584	0.9163
YKB	-0.0007	0.0604	-3.7302	37.9140	0.8778
YUN	-0.0028	0.0494	-1.0299	8.8970	0.5781

TABLE A.2
DAILY DATA
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
AAA	-0.7706	0.1280	0.2554
AAC	-0.7676	0.1282	0.2557
ABA	-0.8960	0.2424	0.4783
AFC	0.7993	0.1353	0.2697
AKA	0.3735	0.0959	0.1914
AKB	-1.9439	0.1084	0.2163
AKC	-0.9075	0.0720	0.1440
AKS	0.2938	0.1028	0.2052
ALAK	0.8163	0.0889	0.1775
ALAS	-0.7642	0.2157	0.4282
ALTY	-0.9725	0.1943	0.3862
ANA	-0.3399	0.0745	0.1489
ARC	0.0546	0.0725	0.1448
ASEL	-0.4203	0.1087	0.2169
AYG	0.1792	0.1085	0.2165
BAG	-0.8461	0.0724	0.1447
BOL	0.9300	0.0750	0.1498
BRI	0.4485	0.0797	0.1593
CAN	0.4439	0.0930	0.1857
CEL	-0.5656	0.0721	0.1440
CIMS	-0.5253	0.0722	0.1443
CUK	-0.3644	0.0721	0.1440
DEM	-1.6970	0.1120	0.2236
DEN	-0.6666	0.0889	0.1775
DEVA	0.3703	0.0879	0.1755
DOG	-1.5990	0.0986	0.1969
DOK	-0.3172	0.0726	0.1454
ECZ	0.1175	0.0741	0.1480
ECZI	-1.2450	0.1069	0.2134
EGEB	2.4776*	0.0726	0.1450
EGEE	-0.5336	0.1006	0.2008
EGEG	-1.2064	0.0730	0.1459
EMEK	-0.9802	0.1226	0.2447
ENK	0.3334	0.0837	0.1672
ERC	1.0774	0.1165	0.2325
ERE	-0.0429	0.0722	0.1442
FIN	-1.6071	0.0983	0.1963
GEN	-0.8371	0.1005	0.2007
GOOD	-0.3493	0.0721	0.1442

"*" represents significance at 5%.

(table con'd)

TABLE A.2
DAILY DATA
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
GOR	0.1614	0.1174	0.2344
GUB	-0.9772	0.0735	0.1469
GUN	1.9105	0.0759	0.1516
HEK	-0.6587	0.0737	0.1472
HURG	-1.4340	0.2391	0.4738
IKT	-0.2375	0.0964	0.1925
INT	-0.1948	0.1005	0.2007
ISM	-1.5172	0.1407	0.2805
IZM	-0.7692	0.0726	0.1452
IZO	-0.0888	0.0743	0.1484
KAR	-0.7094	0.0720	0.1439
KAV	-1.0706	0.0744	0.1486
KEL	-1.1305	0.1176	0.2346
KEN	-0.8562	0.1483	0.2954
KEP	-0.5242	0.0746	0.1491
KOCH	0.0977	0.0759	0.1516
KOCY	0.5282	0.0722	0.1443
KON	0.8274	0.1164	0.2322
KORD	-0.7802	0.0720	0.1439
KORU	-0.8427	0.0723	0.1445
KOY	-0.0860	0.0851	0.1699
KUT	0.1422	0.1135	0.2265
MAK	-0.9786	0.0923	0.1844
MARE	0.2296	0.0806	0.1611
MARM	-0.2286	0.0741	0.1480
MARMA	-0.4588	0.0998	0.1992
MBV	-0.5637	0.1168	0.2330
MEN	-0.6243	0.0868	0.1734
MIG	0.9297	0.1291	0.2575
NAS	-0.8839	0.0731	0.1460
NET	-0.6973	0.0904	0.1805
NETH	-1.0700	0.0933	0.1862
NETT	-0.4150	0.1686	0.3357
NIG	-0.0732	0.1568	0.3124
OKAN	-0.5486	0.0990	0.1977
OLM	-1.2242	0.0733	0.1465
OTO	0.6050	0.0728	0.1455
PAR	-1.8175	0.1150	0.2294
PEG	-0.9369	0.0979	0.1955
PET	-1.2069	0.1069	0.2134

"*" represents significance at 5% level. (table con'd)

TABLE A.2
DAILY DATA
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T H_o : μ =0	Standard error of skewness	Standard error of excess kurtosis
PETR	-0.7834	0.1601	0.3189
PIN	-0.1489	0.0773	0.1545
PINE	-0.2360	0.0822	0.1643
PINSU	-0.1356	0.0803	0.1604
PINU	1.4155	0.1049	0.2095
PMA	-0.1819	0.0860	0.1717
POAS	0.5128	0.1407	0.2805
RAB	-0.8319	0.0729	0.1457
SANT	-1.0484	0.0953	0.1904
SAR	0.1543	0.0725	0.1450
SIF	-0.6760	0.0882	0.1761
SKS	-0.9419	0.1031	0.2059
SON	-0.4754	0.1852	0.3683
SUNE	-0.6781	0.1330	0.2653
TAMSI	-0.5139	0.1058	0.2112
TDT	-1.4446	0.1147	0.2289
TEL	0.4361	0.0740	0.1478
TGAR	-1.0350	0.1005	0.2007
TIB	0.2066	0.0739	0.1476
TIR	-0.0004	0.1811	0.3602
TKB	-1.3463	0.1313	0.2619
TOF	-0.6577	0.1456	0.2902
TOFO	0.6105	0.1474	0.2938
TRK	-0.8793	0.1165	0.2325
TSI	-0.4614	0.0742	0.1482
TSIC	-0.5164	0.0727	0.1452
TSKB	0.0240	0.0887	0.1771
TUDD	0.0624	0.0720	0.1440
TURP	1.1332	0.1407	0.2805
TURY	-1.2015	0.1240	0.2474
TUTU	0.4429	0.1336	0.2665
TUYT	-0.3521	0.1255	0.2503
UNYE	-0.7581	0.1257	0.2507
USS	-0.8943	0.1190	0.2374
VAKY	-0.1807	0.0803	0.1604
VES	-2.0269*	0.1068	0.2132
VKL	-1.4316	0.1419	0.2829
YAS	0.0973	0.0728	0.1454
YKB	-0.3260	0.0828	0.1654
YUN	-1.3539	0.1016	0.2029

"*" represents significance at 5% level.

TABLE A.3
DAILY DATA
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
AAA	0.2013*	18045*	1579956*	1598001*	2.0754	0.0313
AAC	0.2593*	12042*	1051094*	1063136*	2.3316	0.0251
ABA	0.9764	0	48*	48*	2.9800	0.1068*
AFC	0.9515*	2	108*	110*	10.1250*	0.2284*
AKA	0.9810	1	221*	222*	6.0154	0.0997*
AKB	0.7893*	976*	44145*	45121*	5.4278	0.1319*
AKC	0.6797*	12872*	1021395*	1034267*	9.9702*	0.0404*
AKS	0.9711*	1	274*	275*	7.4759	0.1155*
ALAK	0.6713*	8221*	543095*	551316*	6.3710	0.1148*
ALAS	0.9737	0	70*	70*	3.7219	0.1884*
ALTY	0.9281*	1	350*	351*	4.7973	0.1161*
ANA	0.9150*	658*	21821*	22479*	6.4704	0.0313
ARC	0.6434*	8857*	365610*	374467*	8.8050	0.0626*
ASEL	0.9703*	2	225*	227*	7.4851	0.1154*
AYG	0.6577*	4384*	194806*	199190*	4.5621	0.0412
BAG	0.4965*	34705*	3575849*	3610554*	5.0151	0.0526
BOL	0.5558*	16866*	1077418*	1094284*	8.2308	0.0247
BRI	0.8158*	3009*	147557*	150566*	6.3636	0.0508
CAN	0.8403*	2119*	108291*	110410*	7.4611	0.1121*
CEL	0.7164*	5665*	212916*	218581*	6.1236	0.0618*
CIMS	0.7917*	4390*	214312*	218702*	7.0074	0.0968*
CUK	0.6969*	6393*	254967*	261360*	5.5741	0.0862*
DEM	0.7518*	994*	17124*	18118*	6.5983	0.0446
DEN	0.9017*	895*	39990*	40885*	5.5620	0.0677*
DEVA	0.6186*	12177*	943030*	955207*	4.9232	0.0728*
DOG	0.7901*	2539*	119199*	121738*	4.9245	0.0310
DOK	0.7143*	6344*	265441*	271785*	6.2819	0.0606*
ECZ	0.5546*	10848*	852657*	863505*	7.0612	0.0630*
ECZI	0.5812*	5628*	236746*	242374*	4.4962	0.0955*
EGEB	0.7842*	9339*	958625*	967964*	5.6435	0.0347
EGEE	0.5495*	8574*	438459*	447033*	4.0219	0.0289
EGEG	0.7599*	6277*	373631*	379908*	5.7719	0.0410
EMEK	0.7602*	472*	10505*	10977*	4.3668	0.0598
ENK	0.8286*	1303*	26002*	27306*	6.0072	0.0792*
ERC	0.7007*	3730*	209152*	212882*	5.0131	0.0773*
ERE	0.4874*	57097*	9926002*	9983098*	4.3436	0.0286
FIN	0.6003*	5543*	14614*	220157*	6.5136	0.0531
GEN	0.7152*	3904*	173496*	177400*	5.7729	0.0596
GOOD	0.8108*	3204*	135180*	138384*	7.3407	0.0663*

"*" represents significance at 5% .

(table con'd)

TABLE A.3
DAILY DATA
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
GOR	0.7351*	2753*	156291*	159045*	5.8990	0.1269*
GUB	0.9682*	5*	620*	625*	4.9496	0.0544*
GUN	0.9176*	1069*	54062*	55131*	9.0631	0.0620*
HEK	0.8291*	2300*	79890*	82190*	5.6282	0.0339
HURG	0.6882*	492*	9538*	10031*	4.3266	0.1610*
IKT	0.9544*	27*	1087*	1114*	6.1566	0.0423
INT	0.7241*	2835*	95498*	98333*	4.4270	0.0626*
ISM	0.7600*	526*	8408*	8934*	4.7560	0.0659*
IZM	0.8712*	1950*	91238*	93188*	5.1164	0.0566
IZO	0.6942*	7517*	351698*	359214*	6.3195	0.0368
KAR	0.7384*	6405*	353050*	359455*	6.0285	0.0336
KAV	0.6971*	6292*	240029*	246321*	5.8305	0.0427*
KEL	0.8378*	968*	34118*	35086*	9.2702*	0.0779*
KEN	0.2279*	9919*	642272*	652191*	2.0055	0.0282
KEP	0.8017*	2670*	101312*	103982*	6.1688	0.0431*
KOCH	0.6957*	9487*	570540*	580027*	6.3803	0.0702*
KOCY	0.7782*	3760*	137879*	141639*	5.6049	0.0477
KON	0.9838	1	375*	376*	7.1063	0.0919*
KORD	0.8389*	1435*	32446*	33881*	8.7148	0.0390
KORU	0.7474*	12178*	1279078*	1291256*	5.5850	0.0739*
KOY	0.5395*	29065*	3858340*	3887405*	4.0824	0.0342
KUT	0.9709*	0	147*	147*	9.5214*	0.1320*
MAK	0.6768*	5534*	261744*	267278*	6.2800	0.0825*
MARE	0.9330*	359*	9799*	10158*	6.3787	0.0666*
MARM	0.9637*	14*	1691*	1705*	6.6773	0.0516*
MARMA	0.9240*	369*	11326*	11695*	7.0143	0.0577
MBV	0.8253*	1362*	56707*	58069*	4.9308	0.0790*
MEN	0.6725*	6385*	298699*	305084*	7.4866	0.0405
MIG	0.6133*	4547*	250597*	255143*	6.8717	0.0535
NAS	0.9173*	867*	37425*	38292*	6.0773	0.0254
NET	0.9012*	443*	10475*	10918*	4.5704	0.0377
NETH	0.9181*	362*	9403*	9765*	5.9337	0.0512
NETT	0.3348*	3071*	94687*	97758*	3.2979	0.0406
NIG	0.8007*	127*	2731*	2858*	6.2058	0.0703
OKAN	0.9591*	72*	1796*	1868*	5.7338	0.0753*
OLM	0.7693*	8693*	749925*	758618*	6.1610	0.0557*
OTO	0.9272*	386*	8628*	9014*	5.8582	0.0776*
PAR	0.8137*	1103*	34251*	35355*	5.1175	0.0314
PEG	0.9079*	279*	6330*	6609*	6.1882	0.0708*
PET	0.9079*	197*	7606*	7804*	5.9915	0.0451

"*" represents significance at 5% level. (table con'd)

TABLE A.3
DAILY DATA
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
PETR	0.9491*	0	98*	99*	4.8542	0.1129*
PIN	0.8708*	2122*	114826*	116948*	4.6870	0.0716*
PINE	0.9579*	46*	1407*	1453*	7.6647	0.0572*
PINSU	0.9803*	0	438*	438*	5.6592	0.0646*
PINU	0.9456*	0	129*	129*	6.5031	0.1139*
PMA	0.9551*	70*	1279*	1349*	5.4123	0.1237*
POAS	0.9688*	0	106*	106*	5.7803	0.1534*
RAB	0.8066*	3898*	243978*	247876*	6.6364	0.0809*
SANT	0.3582*	20543*	1447555*	1468098*	4.0181	0.0353
SAR	0.5861*	32789*	4524761*	4557550*	5.2511	0.0357
SIF	0.8352*	1531*	44770*	46301*	5.8111	0.0825*
SKS	0.8759*	821*	25962*	26783*	5.4547	0.1229*
SON	0.8446*	43*	523*	566*	3.8831	0.0723
SUNE	0.7400*	1608*	60470*	62078*	4.9490	0.1109*
TAMSI	0.9805	6*	363*	369*	4.8646	0.0632*
TDT	0.9145*	205*	6267*	6472*	4.9693	0.0776*
TEL	0.8219*	4614*	347559*	352173*	7.4903	0.0705*
TGAR	0.7762*	1718*	58861*	60579*	5.0978	0.0379
TIB	0.9155*	589*	17523*	18112*	6.3028	0.0990*
TIR	0.9502*	0	77*	77*	4.7028	0.0791
TKB	0.8475*	462*	15229*	15691*	3.9902	0.0753
TOF	0.7264*	1194*	32024*	33218*	4.4614	0.1517*
TOFO	0.9494*	42*	970*	1012*	5.7026	0.0762
TRK	0.9163*	188*	6368*	6556*	6.1226	0.0496
TSI	0.7371*	5526*	238311*	243837*	5.2654	0.0399
TSIC	0.7521*	9074*	737062*	746136*	7.0743	0.0860*
TSKB	0.9550*	44*	1003*	1047*	5.2724	0.0792*
TUDD	0.8085*	2623*	85102*	87725*	7.4484	0.0819*
TURP	0.9699*	0	80*	80*	7.8432	0.1472*
TURY	0.8901*	103*	5738*	5842*	7.1080	0.0664
TUTU	0.9430*	1	116*	117*	6.5761	0.1166*
TUYT	0.7286*	1297*	31331*	32628*	5.8888	0.0940*
UNYE	0.7598*	1249*	37721*	38970*	5.7621	0.0485
USS	0.7136*	3247*	177874*	181120*	4.1339	0.0496
VAKY	0.9628*	0	103*	103*	5.0565	0.1126*
VES	0.8808*	734*	27591*	28325*	6.3232	0.0866*
VKL	0.5940*	2262*	73913*	76175*	5.3241	0.0815*
YAS	0.8307*	2277*	85675*	87952*	7.2911	0.0386
YKB	0.8079*	2022*	60825*	62847*	5.8298	0.0687*
YUN	0.9448*	101*	3406*	3507*	5.4926	0.0520

"*" represents significance at 5% level.

TABLE A.4
DAILY DATA
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
AAA	0.003	0.038	0.260
AAC	0.004	0.010	0.024
ABA	8.080*	1.232	0.140
AFC	3.425	6.535*	9.640*
AKA	3.080	0.067	1.102
AKB	0.677	2.872	1.722
AKC	0.080	0.993	0.740
AKS	6.333*	2.505	3.447
ALAK	0.004	0.252	0.200
ALAS	1.869	3.780	0.615
ALTY	27.031*	8.599*	1.203
ANA	0.037	2.089	0.786
ARC	0.041	0.087	0.112
ASEL	9.259*	0.704	3.749
AYG	0.008	0.000	6.240*
BAG	0.026	0.740	4.085*
BOL	0.001	0.090	0.433
BRI	0.029	0.244	0.649
CAN	0.380	0.377	0.020
CEL	0.043	0.017	0.080
CIMS	0.123	0.823	0.233
CUK	0.059	1.557	0.476
DEM	0.035	0.170	0.972
DEN	6.153*	6.940*	1.333
DEVA	0.031	0.013	3.655
DOG	0.014	0.307	0.380
DOK	0.172	0.914	0.010
ECZ	6.101*	8.485*	28.362*
ECZI	0.020	1.954	2.893
EGEB	0.034	0.042	1.803
EGEE	0.017	0.000	5.340*
EGEG	0.010	0.009	13.648*
EMEK	0.075	0.371	14.373*
ENK	0.674	1.920	0.240
ERC	0.000	0.253	7.514*
ERE	0.013	0.011	0.127
FIN	0.011	0.062	0.014
GEN	0.006	0.008	4.583*
GOOD	0.351	1.473	1.261

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

(table con'd)

TABLE A.4
DAILY DATA
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
GOR	0.002	1.292	0.906
GUB	72.844*	0.319	3.267
GUN	0.043	0.027	15.649*
HEK	0.241	0.439	0.813
HURG	0.011	0.085	2.241
IKT	5.883*	0.112	13.796*
INT	0.027	0.733	3.119
ISM	0.025	2.441	10.790*
IZM	1.086	0.556	0.024
IZO	0.000	0.028	0.147
KAR	0.017	0.982	0.567
KAV	0.013	0.273	1.120
KEL	0.001	0.322	13.852*
KEN	0.002	0.259	1.074
KEP	0.003	0.006	0.296
KOCH	0.011	0.094	0.183
KOCY	0.061	0.066	9.192*
KON	21.856*	2.889	0.369
KORD	0.215	0.189	3.566
KORU	0.048	0.776	4.541*
KOY	0.000	0.874	9.759*
KUT	7.795	0.055	1.993
MAK	0.069	0.346	6.524*
MARE	0.537	0.659	7.492*
MARM	16.623*	4.371*	5.667*
MARMA	0.004	0.395	26.219*
MBV	0.002	0.238	0.935
MEN	0.043	0.427	3.392
MIG	0.044	1.844	0.948
NAS	0.003	0.451	1.351
NET	0.001	0.805	0.000
NETH	0.644	0.057	0.399
NETT	0.010	0.017	0.122
NIG	0.243	5.094*	3.956*
OKAN	0.583	0.090	0.314
OLM	0.009	1.307	7.856*
OTO	1.837	0.007	9.950*
PAR	0.000	0.094	0.116
PEG	0.083	1.795	0.001
PET	0.443	0.023	1.994

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

(table con'd)

TABLE A.4
DAILY DATA
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
PETR	14.315*	0.016	1.552
PIN	0.112	2.077	0.192
PINE	4.312*	0.287	1.816
PINSU	20.125*	2.080	4.461*
PINU	10.958*	0.002	7.169*
PMA	9.700*	4.637*	0.332
POAS	2.412	7.055	3.398
RAB	0.171	0.608	2.287
SANT	0.000	0.176	0.345
SAR	0.100	0.653	1.324
SIF	0.036	0.332	0.486
SKS	0.176	0.380	0.122
SON	12.880*	1.975	1.846
SUNE	0.135	2.130	0.100
TAMSI	0.592	2.141	0.033
TDT	0.141	0.104	6.099*
TEL	0.023	0.130	20.392*
TGAR	0.277	1.605	1.145
TIB	1.680	2.158	0.417
TIR	0.080	3.795	1.029
TKB	1.745	2.890	12.386*
TOF	0.029	0.457	6.895*
TOFO	0.009	0.239	0.431
TRK	0.016	0.128	2.224
TSI	0.110	0.007	4.509*
TSIC	0.069	0.273	0.025
TSKB	5.867*	0.867	4.703*
TUDD	0.420	0.312	0.312
TURP	10.390*	1.526	0.845
TURY	0.002	0.131	3.622
TUTU	9.278*	3.778	0.486
TUYT	0.245	0.767	0.084
UNYE	0.252	0.639	0.203
USS	0.003	0.012	2.793
VAKY	246.134*	3.883*	0.353
VES	0.004	0.012	6.481*
VKL	0.155	0.662	1.231
YAS	0.000	0.380	1.643
YKB	0.008	0.002	2.259
YUN	0.713	0.000	25.823*

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

TABLE A.5
DAILY DATA
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$	AUTOCORRELATION FOR LAG -1 D	D^2	$\|D\|$
AAA	1.82	0.02	0.52	0.025	-0.003	0.006
AAC	0.96	0.02	0.33	-0.028	-0.003	0.013
ABA	7.72	16.53*	11.97	0.009	0.273*	0.233*
AFC	32.56*	48.54*	73.47*	0.281*	0.305*	0.376*
AKA	18.10*	77.28*	69.49*	0.134*	0.136*	0.120*
AKB	19.01*	0.80	51.00*	-0.144*	0.029	0.207*
AKC	7.59	0.06	41.66*	0.031	0.004	0.135*
AKS	17.16*	65.41*	71.37*	0.142*	0.114*	0.172*
ALAK	27.08*	0.04	15.35*	0.161*	0.001	0.092*
ALAS	8.28	7.59	8.07	0.169*	0.155*	0.185*
ALTY	5.35	21.95*	18.36*	0.014	0.366*	0.277*
ANA	6.64	0.17	43.93*	0.019	0.008	0.134*
ARC	8.08	0.13	37.72*	0.077*	0.006	0.131*
ASEL	11.24	71.83*	107.18*	0.127*	0.178*	0.208*
AYG	4.38	0.04	11.03	0.031	-0.006	0.038
BAG	6.66	0.03	8.79	0.065*	0.001	0.074*
BOL	1.82	0.05	10.99	-0.008	-0.001	0.061*
BRI	5.22	0.11	39.59*	0.035	0.001	0.118*
CAN	25.88*	0.05	16.91*	0.121*	-0.001	0.142*
CEL	10.65	0.23	44.53*	0.068*	0.010	0.140*
CIMS	23.38*	0.13	64.28*	0.112*	0.001	0.133*
CUK	17.04*	0.15	19.38*	0.116*	0.003	0.101*
DEM	4.55	0.26	13.49*	-0.028	0.010	0.103*
DEN	10.72	2.19	71.94*	0.096*	0.045	0.172*
DEVA	8.15	0.05	6.47	0.089*	-0.003	0.054
DOG	1.98	0.08	8.85	-0.017	-0.005	0.052
DOK	8.14	0.15	22.18*	0.081*	0.002	0.118*
ECZ	7.15	9.94	54.68*	-0.070*	0.095*	0.200*
ECZI	11.00	0.05	4.01	0.131*	0.001	0.068*
EGEB	4.22	0.04	80.23*	0.025	0.002	0.143*
EGEE	1.43	0.06	1.55	-0.011	-0.005	-0.008
EGEG	2.13	0.08	17.69*	0.031	0.001	0.101*
EMEK	6.88	0.53	37.11*	0.047	0.024	0.255*
ENK	14.54*	0.18	29.93*	0.102*	0.009	0.131*
ERC	6.73	0.06	2.69	0.091*	-0.005	0.018
ERE	5.51	0.01	12.19	0.025	0.001	0.070*
FIN	4.75	0.07	2.87	-0.045	-0.005	0.024
GEN	3.01	0.16	0.91	0.066	-0.008	-0.005
GOOD	9.63	0.70	123.82*	0.065*	0.007	0.148*

"*" represents significance at 5% level.

$X^2(6)=12.5916$

(table con'd)

TABLE A.5
DAILY DATA
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$	AUTOCORRELATION FOR LAG -1 D	D^2	$\|D\|$
GOR	14.46*	0.05	17.29*	0.149*	0.007	0.116*
GUB	9.07	135.89*	196.50*	0.060	0.280*	0.308*
GUN	9.39	0.48	86.12*	0.055	0.001	0.155*
HEK	4.18	2.89	96.74*	0.020	0.010	0.136*
HURG	8.26	0.14	1.75	0.127*	-0.013	0.015
IKT	4.73	16.79*	83.13*	-0.026	0.094*	0.205*
INT	4.74	0.19	32.79*	0.075*	0.007	0.141*
ISM	4.12	0.26	23.96*	-0.060	0.007	0.157*
IZM	7.76	0.48	132.21*	0.056	0.013	0.182*
IZO	2.47	0.11	19.09*	0.034	0.000	0.099*
KAR	2.65	0.10	83.64*	0.025	0.005	0.169*
KAV	4.52	0.10	23.71*	0.040	0.001	0.077*
KEL	18.90*	1.61	23.03*	0.012	-0.004	0.054
KEN	0.75	0.02	0.12	-0.027	-0.003	0.010
KEP	7.00	0.18	30.92*	0.024	0.001	0.103*
KOCH	12.27	0.12	11.91	0.089*	-0.004	0.056
KOCY	7.19	0.09	83.61*	0.063*	0.006	0.148*
KON	9.26	27.48*	64.52*	0.106*	0.188*	0.204*
KORD	3.16	0.29	71.74*	0.042	0.007	0.156*
KORU	14.19*	0.06	37.16*	0.066*	-0.001	0.076*
KOY	6.34	0.02	10.55	-0.008	0.001	0.081*
KUT	15.34*	33.96*	45.09*	0.152*	0.181*	0.238*
MAK	9.59	0.08	17.06*	0.079*	0.009	0.118*
MARE	10.85	0.92	39.10*	0.053	0.015	0.152*
MARM	9.59	37.85*	167.46*	0.036	0.120*	0.227*
MARMA	9.28	0.14	10.42	-0.030	-0.003	0.097*
MBV	5.86	0.16	10.97	0.067	-0.006	0.046
MEN	8.38	0.08	33.75*	0.021	0.003	0.112*
MIG	4.27	0.07	12.41	0.009	0.009	0.144*
NAS	2.12	0.13	59.36*	0.015	0.001	0.144*
NET	9.15	0.25	73.07*	0.006	-0.001	0.149*
NETH	6.00	1.18	39.18*	0.024	0.022	0.147*
NETT	0.51	0.04	3.09	-0.002	-0.007	0.035
NIG	8.66	6.27	53.79*	0.031	0.041	0.173*
OKAN	10.77	3.68	22.11*	-0.097*	0.046	0.148*
OLM	7.66	0.04	23.39*	0.049	0.000	0.089*
OTO	11.52	2.32	114.42*	0.096*	0.035	0.198*
PAR	3.15	0.47	17.62*	-0.011	0.000	0.069*
PEG	6.29	2.14	36.19*	0.068	0.014	0.135*
PET	5.95	3.86	140.01*	-0.021	0.026	0.279*

"*" represents significance at 5% level.

$X^2(6)=12.5916$

(table con'd)

TABLE A.5
DAILY DATA
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6)	LB(6)	LB(6)	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\lvert D \rvert$	D	D^2	$\lvert D \rvert$
PETR	7.96	80.74*	87.07*	0.124*	0.347*	0.351*
PIN	10.69	1.35	116.06*	0.083*	0.022	0.199*
PINE	6.98	16.02*	90.75*	0.064	0.095*	0.224*
PINSU	14.00*	80.15*	113.03*	0.049	0.155*	0.187*
PINU	16.02*	73.88*	60.98*	0.138*	0.167*	0.146*
PMA	21.96*	9.41	10.47	0.154*	0.099*	0.101*
POAS	16.24*	13.47*	10.77	0.193*	0.131*	0.106*
RAB	18.08*	0.34	89.58*	0.117*	0.017	0.197*
SANT	1.64	0.03	2.50	0.039	-0.002	0.036
SAR	6.05	0.06	25.44*	0.020	0.007	0.140*
SIF	11.56	0.16	7.97	0.097*	-0.001	0.053
SKS	28.72*	0.65	19.81*	0.125*	0.022	0.141*
SON	7.53	56.92*	71.90*	-0.012	0.271*	0.387*
SUNE	8.75	0.05	13.64*	0.135*	0.008	0.131*
TAMSI	8.53	5.10	10.18	0.005	0.043	0.110*
TDT	11.54	1.13	36.96*	-0.093*	0.003	0.131*
TEL	12.61*	0.11	90.50*	0.074*	0.009	0.177*
TGAR	5.36	0.26	23.83*	-0.016	0.017	0.182*
TIB	26.03*	5.80	205.40*	0.136*	0.029	0.218*
TIR	5.53	13.93*	11.03	-0.096*	0.049	0.068*
TKB	19.02*	5.37	47.98*	0.020	0.086*	0.230*
TOF	17.86*	0.14	6.69	0.201*	0.004	0.071*
TOFO	5.03	0.35	8.50	0.065	-0.001	0.083*
TRK	5.25	0.69	28.41*	0.026	0.005	0.155*
TSI	3.40	0.73	33.96*	0.039	0.006	0.121*
TSIC	14.38*	0.05	14.52*	0.103*	-0.003	0.039
TSKB	10.53	15.57*	83.30*	0.101*	0.084*	0.206*
TUDD	22.48*	0.79	86.90*	0.110*	0.017	0.158*
TURP	16.05*	35.22*	21.80*	0.178*	0.206*	0.186*
TURY	7.36	0.14	6.07	-0.073*	-0.004	0.029
TUTU	13.27*	31.25*	38.65*	0.158*	0.205*	0.216*
TUYT	6.22	0.18	11.38	-0.113*	0.009	0.121*
UNYE	3.69	1.09	40.76*	0.030	0.020	0.142*
USS	3.29	0.10	16.85*	-0.041	0.003	0.074*
VAKY	4.28	42.16*	17.79*	-0.124*	0.364*	0.205*
VES	8.22	0.19	24.07*	0.094*	-0.005	0.093*
VKL	7.62	0.12	16.64*	-0.050	0.014	0.191*
YAS	8.78	0.08	33.46*	0.018	-0.000	0.099*
YKB	8.51	0.13	22.91*	0.072*	-0.005	0.091*
YUN	5.26	2.41	35.89*	-0.060	0.024	0.163*

"*" represents significance at 5% level.

$X^2(6)=12.5916$

TABLE A.6
DAILY DATA
BDS, THIRD ORDER, AND LONG TERM MEMORY TESTS

	BDS TEST	THIRD ORDER	R/S TEST
AAA	-0.29	0.0182	0.9846
AAC	6.84*	0.0053	1.6060
ABA	___	0.3721	1.0045
AFC	649.61*	0.0018	0.9368
AKA	11.68*	-0.0029	1.3992
AKB	15.41*	-0.0078	1.1825
AKC	13.71*	-0.0117	1.2890
AKS	14.25*	0.0279	0.9766
ALAK	7.27*	0.0022	1.1715
ALAS	-3.36*	-0.0052	1.0636
ALTY	2.35*	N.A.	0.9765
ANA	12.29*	0.1360	1.5018
ARC	14.01*	0.0031	2.0828*
ASEL	11.24*	0.0217	1.0501
AYG	8.10*	0.0071	1.4004
BAG	3.97*	0.0066	1.4748
BOL	7.59*	-0.0020	1.5022
BRI	14.48*	0.0226	1.1913
CAN	8.76*	-0.0011	1.3292
CEL	17.10*	0.0068	1.4222
CIMS	17.11*	-0.0244	1.5841
CUK	12.22*	0.0083	1.5258
DEM	10.19*	0.0444	1.3902
DEN	12.26*	0.2665	1.5655
DEVA	5.62*	0.0151	1.5829
DOG	8.46*	-0.0151	1.9038*
DOK	1.51	0.0125	0.9681
ECZ	3.07*	-0.0028	1.0763
ECZI	5.96*	0.0105	1.4407
EGEB	15.82*	0.0224	1.5398
EGEE	2.11*	-0.0016	1.9722*
EGEG	10.46*	0.0014	1.2737
EMEK	13.76*	0.0168	0.9683
ENK	14.46*	-0.0328	1.4231
ERC	2.95*	0.0077	1.6768
ERE	9.97*	-0.0024	1.4572
FIN	6.83*	0.0310	1.1946
GEN	3.89*	-0.0952	1.4105
GOOD	19.31*	0.0369	1.2184

$\chi^2(1)=3.84146$

±5% *RANGE OF R/S STAT*=(0.809-1.862)

"*" represents significance at 5% level. (table con'd)

TABLE A.6
DAILY DATA
BDS, THIRD ORDER, AND LONG TERM MEMORY TESTS

	BDS TEST	THIRD ORDER	R/S TEST
GOR	4.39*	0.0086	1.8800*
GUB	19.48*	-0.0212	2.1787*
GUN	16.48*	-0.0182	1.8544*
HEK	18.51*	0.0192	1.2890
HURG	2.69*	0.0290	1.0135
IKT	18.17*	0.0630	1.1596
INT	11.54*	-0.2124	1.4658
ISM	9.87*	-0.0697	1.3224
IZM	2.06*	0.0057	1.4312
IZO	10.21*	0.0018	1.2645
KAR	20.23*	0.0167	1.1904
KAV	12.21*	0.0193	1.5689
KEL	5.08*	-0.0038	1.6727
KEN	-0.38	-0.0009	1.0259
KEP	9.49*	-0.0132	1.4287
KOCH	10.77*	-0.0046	2.0999*
KOCY	19.62*	-0.0359	1.0463
KON	14.04*	-0.0036	1.0465
KORD	22.62*	0.0109	1.3721
KORU	9.06*	-0.0076	1.4863
KOY	1.02	-0.0624	1.0122
KUT	20.34*	0.0029	1.4365
MAK	5.07*	-0.0557	1.0533
MARE	13.54*	0.0011	1.1894
MARM	30.46*	0.0627	1.8808*
MARMA	9.99*	-0.0221	1.6062
MBV	5.05*	0.0119	1.5799
MEN	11.11*	-0.0071	1.7511
MIG	6.54*	0.0133	1.4128
NAS	17.60*	-0.0035	1.5448
NET	18.33*	1.8965	1.4183
NETH	18.08*	0.0069	1.8660*
NETT	-0.53	-0.0227	1.0037
NIG	4.96*	-0.0298	1.3092
OKAN	11.38*	-0.0042	1.6179
OLM	9.09*	0.0234	1.6102
OTO	27.17*	-0.1231	1.3300
PAR	5.86*	-0.0005	1.4838
PEG	6.87*	0.0190	1.6377

$\chi^2(1)=3.84146$

±5% *RANGE OF R/S STAT*=(0.809-1.862)

(table con'd)

TABLE A.6
DAILY DATA
BDS, THIRD ORDER, AND LONG TERM MEMORY TESTS

	BDS TEST	THIRD ORDER	R/S TEST
PET	24.10*	-0.0138	2.0027*
PETR	16.69*	0.0097	1.1670
PIN	15.87*	-0.0185	2.1296*
PINE	27.22*	0.0077	1.8809*
PINSU	20.82*	0.0138	2.1328*
PINU	17.27*	0.0030	1.4401
PMA	5.26*	0.0016	1.2899
POAS	42.21*	0.0551	1.0114
RAB	17.73*	0.0064	1.8501
SANT	-0.29	-0.0070	1.2467
SAR	9.09*	0.0075	1.4716
SIF	7.30*	0.0089	1.4403
SKS	7.63*	0.0034	1.2507
SON	8.52*	N.A.	1.1258
SUNE	8.86*	-0.0044	1.6339
TAMSI	3.83*	-0.0259	1.0581
TDT	7.74*	-0.0099	1.7234
TEL	14.02*	-0.0244	1.4140
TGAR	10.99*	0.0113	1.5320
TIB	30.14*	0.0135	1.6098
TIR	3.71*	-0.0016	1.6339
TKB	12.68*	-0.0008	1.2792
TOF	3.09*	-0.0177	1.2361
TOFO	13.13*	-0.0230	1.1541
TRK	11.28*	-0.0996	0.9896
TSI	12.48*	-0.0342	1.5117
TSIC	8.21*	0.0378	1.6827
TSKB	15.98*	N.A.	1.6043
TUDD	21.26*	-0.0262	1.0969
TURP	26.38*	0.0036	1.0308
TURY	6.99*	-0.0036	1.4702
TUTU	20.88*	-0.0216	0.9715
TUYT	10.55*	0.0005	1.1574
UNYE	8.21*	0.1026	1.7729
USS	6.05*	-0.0096	1.4034
VAKY	8.05*	-0.0173	1.7424
VES	9.39*	-0.0124	1.3537
VKL	6.76*	0.0042	1.3669
YAS	1.49	0.0040	1.3826
YKB	16.09*	0.8542	1.6274

$\chi^2(1)=3.84146$

±5% *RANGE OF R/S STAT*=(0.809-1.862)

TABLE A.7
DAILY DATA
TESTS FOR UNIT ROOT

	A.D.F.P $\alpha_1=0$	A.D.F.DP $\alpha_1=0$	P.P.P $\alpha_1=0$	P.P.DP $\alpha_1=0$
AAA	-3.5467*		-7.0977*	
AAC	-2.5168	-8.9489*	-5.5025*	
ABA	-2.0797	-2.7470	-2.4238	-9.8766*
AFC	0.1917	-4.4949*	-0.2074	-17.394*
AKA	-3.3103	-4.9773*	-4.5658*	
AKB	-2.1962	-4.9728*	-1.9960	-27.957*
AKC	-3.2772	-5.9693*	-3.9099*	
AKS	-4.5470*		-5.5282*	
ALAK	-4.6144*		-10.997*	
ALAS	-2.3834	-4.8485*	-4.4628*	
ALTY	-1.0488	-4.6539*	-1.4719	-12.297*
ANA	-2.7703	-4.8645*	-8.2469*	
ARC	-2.1132	-7.0583*	-8.6124*	
ASEL	-1.9601	-5.5246*	-8.6904*	
AYG	-3.6531*		-8.6345*	
BAG	-3.4390*		-9.0020*	
BOL	-3.4974*		-13.4300*	
BRI	-3.4874*		-3.6115*	
CAN	-3.1063	-4.9146*	-4.9057*	
CEL	-2.8323	-5.8482*	-5.8185*	
CIMS	-3.2773	-5.8424*	-9.5967*	
CUK	-2.1928	-6.0946*	-5.8143*	
DEM	-3.2646	-5.6877*	-11.1780*	
DEN	-5.1766*		-11.1300*	
DEVA	-3.1695	-5.4968*	-8.4516*	
DOG	-3.5122*		-9.7384*	
DOK	-3.5452*		-5.3165*	
ECZ	-3.9373*		-22.1520*	
ECZI	-2.7735	-7.4101*	-8.7428*	
EGEB	-2.7375	-6.5157*	-9.4390*	
EGEE	-4.5373*		-12.6140*	
EGEG	-4.1719*		-7.0802*	
EMEK	-4.0183*		-4.0183*	
ENK	-3.6180*		-8.9272*	
ERC	-2.4326	-4.4245*	-7.1792*	
ERE	-3.6940*		-10.0920*	
FIN	-4.4391*		-4.4391*	

Dickey Fuller critical value (5%)=-3.4200

(table con'd)

TABLE A.7
DAILY DATA
TESTS FOR UNIT ROOT

	A.D.F.P $\alpha_1=0$	A.D.F.DP $\alpha_1=0$	P.P.P $\alpha_1=0$	P.P.DP $\alpha_1=0$
GEN	-3.2756	-4.4213*	-6.0782*	
GOOD	-3.3119	-6.4543*	-10.0860*	
GOR	-2.4601	-5.9725*	-6.5724*	
GUB	-3.2070	-5.6984*	-12.2470*	
GUN	-2.5823	-6.2515*	-9.5552*	
HEK	-3.0650	-6.1730*	-8.3657*	
HURG	-2.9669	-3.9166*	-3.4555*	
IKT	-3.9567*		-6.7145*	
INT	-3.2923	-4.9419*	-5.8392*	
ISM	-2.1679	-4.0395*	-5.0770*	
IZM	-2.9865	-6.5489*	-6.4391*	
IZO	-4.3218*		-5.9325*	
KAR	-3.3783	-5.2157*	-3.4239*	
KAV	-5.1369*		-6.9083*	
KEL	-2.9802	-4.6053*	-10.3340*	
KEN	-2.3245	-4.9364*	-2.9289	-16.158*
KEP	-3.3869	-6.1793*	-4.0176*	
KOCH	-4.3583*		-15.9290*	
KOCY	-3.6979*		-3.7363*	
KON	-2.6189	-4.5268*	-2.4744	-18.927*
KORD	-3.1513	-6.4937*	-9.3713*	
KORU	-3.3600	-6.1924*	-8.7981*	
KOY	-1.9506	-5.9404*	-11.0250*	
KUT	-2.8778	-5.0852*	-5.5293*	
MAK	-2.8999	-6.0928*	-7.4140*	
MARE	-3.1811	-5.2092*	-5.2265*	
MARM	-3.6918*		-15.6340*	
MARMA	-2.2939	-3.9603*	-7.2396*	
MBV	-2.6622	-4.0807*	-5.2891*	
MEN	-3.3772	-5.7627*	-9.0230*	
MIG	-3.3772	-5.8929*	-6.1736*	
NAS	-3.5678*		-9.8126*	
NET	-1.9169	-4.8541*	-5.1291*	
NETH	-1.6459	-5.2866*	-4.6559*	
NETT	-2.5746	-5.9985*	-2.9843	-14.319*
NIG	-1.8715	-3.9898*	-2.2382	-15.450*
OKAN	-3.0621	-7.4125*	-12.6040*	
OLM	-3.2298	-5.4108*	-6.2100*	

Dickey Fuller critical value (5%)=-3.4200

(table con'd)

TABLE A.7
DAILY DATA
TESTS FOR UNIT ROOT

	A.D.F.P α_1=0	A.D.F.DP α_1=0	P.P.P α_1=0	P.P.DP α_1=0
OTO	-3.9797*		-9.4221*	
PAR	-2.9840	-4.9079*	-3.5080*	
PEG	-3.7669*		-6.5309*	
PET	-2.8701	-6.3407*	-6.3234*	
PETR	-3.0644	-3.9150*	-6.3340*	
PIN	-1.4479	-5.0907*	-9.5503*	
PINE	-3.7113*		-10.855*	
PINSU	-2.9774	-5.6668*	-11.644*	
PINU	-4.4287*		-16.161*	
PMA	-2.9399	-7.2292*	-3.5118*	
POAS	-1.9935	-4.5285*	-1.8497	-14.175*
RAB	-3.0931	-8.2708*	-8.0192*	
SANT	-2.2272	-6.0653*	-4.0717*	
SAR	-3.6308*		-6.7941*	
SIF	-3.7178*		-7.7045*	
SKS	-2.0386	-6.4731*	-3.4896*	
SON	-2.0415	-4.4963*	-4.3489*	
SUNE	-1.7064	-4.6868*	-4.2451*	
TAMSI	-2.6145	-4.6888*	-2.3703	-22.014*
TDT	-0.0127	-4.6848*	-4.9470*	
TEL	-4.1709*		-11.0040*	
TGAR	-1.9858	-4.8875*	-4.3633*	
TIB	-3.5258*		-14.5880*	
TIR	-2.1569	-5.1569*	-8.7959*	
TKB	-0.7727	-5.5035*	-2.3804	-18.391*
TOF	-3.5416*		-4.7374*	
TOFO	-3.2387	-4.0787*	-9.0052*	
TRK	-1.1916	-4.8311*	-1.8838	-20.409*
TSI	-3.6066*		-6.8864*	
TSIC	-3.8719*		-13.6940*	
TSKB	-1.4110	-6.1121*	-6.6582*	
TUDD	-4.1597*		-13.6620*	
TURP	-1.7030	-4.2056*	-1.6065	-14.595*
TURY	-2.0671	-5.3343*	-5.4257*	

Dickey Fuller critical value (5%)=-3.4200

(table con'd)

TABLE A.7
DAILY DATA
TESTS FOR UNIT ROOT

	A.D.F.P		A.D.F.DP		P.P.P	P.P.DP
	$\alpha_1=0$	$\alpha_1=0$	$\alpha_1=0$	$\alpha_1=0$		
TUTU	-1.6176		-4.5851*		-2.2624	-15.497*
TUYT	-3.9630*				-4.1065*	
UNYE	-1.9538		-4.8339*		-7.2062*	
USS	-2.0815		-5.3291*		-5.4661*	
VAKY	-1.9768		-6.7606*		-10.372*	
VES	-2.3981		-4.4134*		-2.7094	-20.917*
VKL	-1.8165		-4.6122*		-1.8165	-17.725*
YAS	-3.2483		-5.3783*		-3.8270*	
YKB	-2.4193		-5.2111*		-5.1310*	
YUN	-2.7150		-4.5074*		-6.7632*	

Dickey Fuller critical value (5%)=-3.4200

TABLE A.8
WEEKLY DATA
DESCRIPTIVE STATISTICS

	mean	std dev	skew	kurt	med	range
AAA	-0.0502	0.4609	-7.8298	64.6673	-0.008	4.0734
AAC	-0.0573	0.4016	-7.3968	59.7215	-0.024	3.5842
ABA	-0.0121	0.0874	0.7002	1.6492	-0.023	0.3952
AFC	0.0115	0.1230	-0.0600	1.1828	0.000	0.2427
AKA	0.0024	0.1340	0.7165	1.4477	0.000	0.3275
AKB	-0.0175	0.0721	-0.9395	4.8765	0.000	0.5252
AKC	-0.0081	0.1298	-1.7839	13.3075	-0.005	1.3446
AKS	-0.0030	0.1599	-0.0224	9.3203	0.000	1.5326
ALAK	0.0114	0.2049	-2.6570	19.5514	0.000	1.8897
ALAS	-0.0148	0.1231	0.4130	1.2053	-0.030	0.6024
ALTY	-0.0109	0.0459	-1.0925	1.1280	0.000	0.1964
ANA	-0.0030	0.1222	-0.8572	3.9266	0.000	1.0427
ARC	0.0003	0.1433	-3.0301	16.1942	0.000	1.1871
ASEL	-0.0046	0.1217	0.5545	2.8819	0.000	0.8368
AYG	-0.0036	0.2303	-3.4113	20.1266	0.000	2.0457
BAG	-0.0108	0.1863	-5.9377	51.7147	0.000	0.0371
BOL	-0.0113	0.1639	-3.4693	23.8443	0.000	1.7024
BRI	-0.0043	0.1271	-1.4809	8.9519	-0.008	1.1034
CAN	0.0081	0.1987	-0.7206	5.2920	0.000	1.5215
CEL	-0.0050	0.1354	-2.8239	15.4361	0.000	1.1925
CIMS	-0.0043	0.1313	-1.3016	9.0891	-0.009	1.2337
CUK	-0.0031	0.1366	-2.6572	14.6441	0.000	1.1810
DEM	-0.0205	0.1077	-2.5720	9.3901	0.000	0.7120
DEN	-0.0077	0.1489	-0.0478	6.4233	0.000	1.3610
DEVA	-0.0027	0.1943	-3.1785	22.4565	0.000	1.9189
DOG	-0.0098	0.1559	-1.6123	11.2717	0.000	1.3885
DOK	-0.0030	0.1542	-2.0989	11.7650	0.000	1.4507
ECZ	0.0015	0.2014	-3.9473	33.5669	0.000	2.3387
ECZI	-0.0204	0.2007	-3.5523	20.8361	-0.014	1.6862
EGEB	0.0196	0.1186	-2.1421	18.9252	0.017	1.3385
EGEE	-0.0138	0.2148	-4.3417	27.1750	0.000	1.8607
EGEG	-0.0119	0.1376	-2.6985	20.1962	0.000	1.4621
EMEK	-0.0014	0.1251	-1.2526	6.0537	0.000	0.8967
ENK	0.0037	0.1603	-0.5711	3.1441	0.000	1.0589
ERC	0.0381	0.3044	2.6844	28.2370	0.022	3.3826
ERE	-0.0003	0.1665	-6.7143	75.5372	0.000	2.2430
FIN	-0.0211	0.1308	-3.4330	19.4173	0.000	1.1420
GEN	-0.0125	0.1705	-2.6438	14.0863	0.000	1.4173
GOOD	-0.0029	0.1374	-0.6924	4.9186	0.000	1.0772
GOR	0.0033	0.2200	2.8738	16.5771	-0.009	1.7533
GUB	-0.0075	0.1038	0.6493	4.6443	0.000	0.8427
GUN	0.0151	0.1226	-0.5889	5.5073	0.000	1.0986
HEK	-0.0060	0.1299	-1.6760	8.3842	0.000	1.1100
HURG	-0.0523	0.1845	-1.8836	5.2015	-0.016	0.8465
IKT	-0.0059	0.0935	-0.0376	2.6046	0.000	0.6789
INT	-0.0027	0.1751	-1.8443	9.2182	0.000	1.4182

(table con'd)

TABLE A.8
WEEKLY DATA
DESCRIPTIVE STATISTICS

	mean	std dev	skew	kurt	med	range
ISM	-0.0322	0.1620	-2.5816	15.9737	0.000	1.2529
IZM	-0.0007	0.1394	-0.3713	4.2713	0.000	1.1878
IZO	-0.0008	0.1504	-3.2543	22.3197	0.000	1.5389
KAR	-0.0055	0.1211	-2.9999	20.4932	0.000	1.2112
KAV	-0.0111	0.1558	-1.7837	8.9652	-0.003	1.3002
KEL	-0.0194	0.1450	-1.7276	10.3209	-0.010	1.1485
KEN	-0.0265	0.2303	-6.2618	42.4733	0.000	1.7895
KEP	-0.0050	0.1325	-1.8360	10.3126	0.000	1.1832
KOCH	0.0010	0.1476	-2.6496	18.6148	0.000	1.5533
KOCY	0.0041	0.1262	-1.8120	11.4289	0.011	1.2031
KON	0.0090	0.1187	-0.1535	0.9371	0.000	0.7309
KORD	-0.0058	0.1138	-0.7934	3.6554	0.000	0.8496
KORU	-0.0077	0.1384	-3.2336	29.5415	0.000	1.6317
KOY	-0.0036	0.2024	-5.3786	54.8168	0.000	2.4548
KUT	0.0024	0.1208	0.6711	2.4422	0.000	0.7667
MAK	-0.0070	0.1971	-1.5492	21.0406	0.000	2.4547
MARE	0.0021	0.1510	-0.4140	3.3513	0.000	1.1266
MARM	-0.0020	0.1101	0.1188	2.9606	-0.013	0.8826
MARMA	-0.0067	0.1174	-1.0061	6.3474	0.000	0.9651
MBV	-0.0047	0.1296	-2.6787	16.3944	0.000	1.0879
MEN	-0.0136	0.1742	-1.8611	9.8508	-0.012	1.4281
MIG	0.0187	0.1574	-4.4055	30.4461	0.027	1.3825
NAS	-0.0083	0.1346	-1.0857	10.3688	0.000	1.2868
NET	-0.0087	0.1346	0.0050	4.2886	0.000	1.0519
NETH	-0.0145	0.1219	-0.1489	3.0398	-0.024	0.9454
NETT	-0.0294	0.4021	-3.5701	16.5462	0.000	2.5878
NIG	-0.0008	0.1312	1.3474	3.8707	0.000	0.7207
OKAN	-0.0078	0.1252	-1.3102	6.8818	0.000	0.9820
OLM	-0.0123	0.1395	-3.2139	27.7013	-0.012	1.6607
OTO	0.0047	0.1220	-0.4672	1.8542	0.000	0.7877
PAR	-0.0318	0.1390	-2.0210	9.9559	0.000	1.0662
PEG	-0.0108	0.1259	-0.5442	4.5839	-0.014	1.0355
PET	-0.0139	0.1074	-1.1352	7.8136	0.000	0.9091
PETR	-0.0081	0.1270	1.0063	5.8000	0.000	0.8593
PIN	-0.0009	0.1444	-2.5813	19.7277	0.000	1.4785
PINE	-0.0022	0.1182	0.0572	2.5252	0.000	0.9062
PINSU	-0.0009	0.1537	-0.0457	3.0138	0.000	1.1920
PINU	0.0111	0.1863	0.0111	4.7702	-0.013	1.5512
PMA	-0.0029	0.1624	0.9742	3.8225	-0.016	1.2577
POAS	0.0065	0.1102	0.7652	0.4068	0.000	0.4662
RAB	-0.0081	0.1493	-2.2356	16.5057	0.000	1.4397
SANT	-0.0217	0.3087	-4.4734	31.9120	-0.019	3.1246
SAR	0.0013	0.1500	-5.0549	46.0569	0.006	1.7489
SIF	-0.0119	0.1593	-0.7892	5.4309	-0.015	1.3122
SKS	-0.0117	0.1899	-1.1970	6.5153	0.000	1.5161

(table con'd)

TABLE A.8
WEEKLY DATA
DESCRIPTIVE STATISTICS

	mean	std dev	skew	kurt	med	range
SON	-0.0042	0.0558	0.1398	5.6251	0.000	0.3517
SUNE	-0.0166	0.1777	-2.2387	13.8286	-0.019	1.4679
TAMSI	-0.0053	0.1061	0.0437	4.4092	0.000	0.8689
TDT	-0.0022	0.1157	-0.9663	5.4988	-0.014	0.8630
TEL	0.0039	0.1149	-1.5089	11.1398	0.000	1.1190
TGAR	-0.0141	0.1155	-1.5747	8.0325	0.000	0.8718
TIB	0.0011	0.1448	0.0969	6.3546	0.000	1.4633
TIR	-0.0239	0.1327	-1.2351	3.1280	0.000	0.6797
TKB	-0.0174	0.0915	-1.5187	4.8651	0.000	0.5594
TOF	-0.0143	0.1894	-1.3038	3.2912	0.009	1.0803
TOFO	0.0111	0.1508	0.2181	2.5190	0.000	0.8932
TRK	-0.0102	0.1057	0.2414	3.0907	-0.021	0.7247
TSI	-0.0052	0.1431	-1.9800	10.1699	0.000	1.1917
TSIC	-0.0047	0.1492	-2.1782	17.1721	0.000	1.5950
TSKB	0.0004	0.1465	1.2931	6.1567	0.000	1.1747
TUDD	0.0006	0.1285	-1.0053	4.9463	0.000	1.0430
TURP	0.0176	0.1377	0.6317	0.4444	0.000	0.6095
TURY	-0.0204	0.1548	0.4785	3.7915	-0.028	1.0068
TUTU	0.0031	0.1625	0.0666	1.1823	0.000	0.8492
TUYT	-0.0048	0.1039	-2.0280	8.7870	0.000	0.7111
UNYE	-0.0147	0.1382	-0.9949	6.0392	-0.007	1.0531
USS	-0.0218	0.1487	-2.0533	12.9428	0.000	1.2537
VAKY	-0.0065	0.1148	-0.0932	1.3734	0.000	0.6377
VES	-0.0247	0.1395	-1.3508	6.2358	0.000	1.0646
VKL	-0.0333	0.1793	-4.1005	21.9785	0.000	1.2965
YAS	-0.0014	0.1282	-0.9323	5.1791	0.000	1.0463
YKB	-0.0045	0.1436	-0.3495	7.3849	0.000	1.3250
YUN	-0.0141	0.1028	-2.3041	13.8515	0.000	0.8896

TABLE A.9
WEEKLY DATA
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
AAA	-0.9236	0.2848	0.5625
AAC	-1.2016	0.2868	0.5663
ABA	-0.6172	0.5238	1.0143
AFC	0.7412	0.3039	0.5993
AKA	0.2007	0.2148	0.4265
AKB	-2.4128*	0.2438	0.4830
AKC	-0.9503	0.1608	0.3203
AKS	-0.1954	0.2304	0.4570
ALAK	0.6796	0.1993	0.3961
ALAS	-0.6130	0.4637	0.9017
ALTY	-1.3251	0.4269	0.8327
ANA	-0.3622	0.1686	0.3357
ARC	0.0327	0.1619	0.3224
ASEL	-0.3771	0.2438	0.4830
AYG	-0.1621	0.2357	0.4673
BAG	-0.8749	0.1619	0.3224
BOL	-0.9915	0.1694	0.3373
BRI	-0.4610	0.1787	0.3555
CAN	0.4674	0.2132	0.4233
CEL	-0.5591	0.1608	0.3203
CIMS	-0.5039	0.1608	0.3205
CUK	-0.3483	0.1612	0.3210
DEM	-1.7998	0.2568	0.5068
DEN	-0.6298	0.2000	0.3975
DEVA	-0.1808	0.1873	0.3725
DOG	-0.7132	0.2140	0.4249
DOK	-0.2901	0.1633	0.3252
ECZ	0.1098	0.1605	0.3196
ECZI	-1.0356	0.2379	0.4716
EGEB	2.4709*	0.1629	0.3245
EGEE	-0.6889	0.2265	0.4493
EGEG	-1.3036	0.1626	0.3228
EMEK	-0.9889	0.2829	0.5588
ENK	0.2993	0.1879	0.3736
ERC	1.1399	0.2657	0.5256
ERE	-0.0300	0.1612	0.3210
FIN	-1.7769	0.2209	0.4383
GEN	-0.7926	0.2255	0.4474
GOOD	-0.3235	0.1612	0.3210

"*" represents significance at 5% . (table con'd)

TABLE A.9
WEEKLY DATA
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
GOR	0.1333	0.2705	0.5350
GUB	-1.0691	0.1644	0.3274
GUN	1.7561	0.1711	0.3405
HEK	-0.6832	0.1659	0.3303
HURG	-1.2671	0.5238	1.0143
IKT	-0.7047	0.2165	0.4298
INT	-0.1672	0.2255	0.4474
ISM	-1.5385	0.3112	0.6133
IZM	-0.7557	0.1626	0.3238
IZO	-0.0761	0.1671	0.3326
KAR	-0.6929	0.1608	0.3203
KAV	-1.0376	0.1682	0.3349
KEL	-1.2105	0.2673	0.5287
KEN	-0.8392	0.3304	0.6501
KEP	-0.5527	0.1682	0.3349
KOCH	0.1001	0.1615	0.3217
KOCY	0.4881	0.1612	0.3210
KON	0.7028	0.2597	0.5139
KORD	-0.7742	0.1608	0.3203
KORU	-0.8377	0.1619	0.3224
KOY	-0.2334	0.1846	0.3673
KUT	0.1864	0.2554	0.5056
MAK	-0.4610	0.1873	0.3725
MARE	0.1871	0.1852	0.3683
MARM	-0.2669	0.1682	0.3349
MARMA	-0.6217	0.2236	0.4437
MBV	-0.3403	0.2612	0.5168
MEN	-0.9884	0.1919	0.3815
MIG	1.0028	0.2868	0.5663
NAS	-0.9153	0.1640	0.3266
NET	-0.7532	0.2085	0.4142
NETH	-1.3706	0.1855	0.2108
NETT	-0.4676	0.3738	0.7326
NIG	-0.0409	0.3537	0.6945
OKAN	-0.6540	0.2304	0.4570
OLM	-1.3049	0.1644	0.3274
OTO	0.5729	0.1633	0.3252
PAR	-2.1458*	0.2582	0.5111
PEG	-0.9528	0.2191	0.4349
PET	-1.3114	0.2391	0.4738

"*" represents significance at 5% level. (table con'd)

TABLE A.9
WEEKLY DATA
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
PETR	-0.4349	0.3537	0.6945
PIN	-0.0870	0.1782	0.3545
PINE	-0.2475	0.1868	0.3715
PINSU	-0.0797	0.1868	0.3715
PINU	0.6162	0.2357	0.4673
PMA	-0.2241	0.1943	0.3863
POAS	0.4554	0.3112	0.6133
RAB	-0.8079	0.1633	0.3252
SANT	-0.8043	0.2124	0.4218
SAR	0.1284	0.1633	0.3252
SIF	-0.9897	0.1846	0.3673
SKS	-0.6501	0.2304	0.4570
SON	-0.4238	0.4269	0.8327
SUNE	-0.7611	0.2971	0.5862
TAMSI	-0.5145	0.2379	0.4716
TDT	-1.8273	0.2568	0.5083
TEL	0.4930	0.1663	0.3311
TGAR	-1.2531	0.2357	0.4673
TIB	0.1068	0.1671	0.3326
TIR	-1.1540	0.3738	0.7326
TKB	-1.5837	0.2908	0.5740
TOF	-0.5634	0.3217	0.6335
TOFO	0.5396	0.3274	0.6444
TRK	-0.9028	0.2597	0.5139
TSI	-0.5280	0.1667	0.3318
TSIC	-0.4706	0.1640	0.3266
TSKB	0.0340	0.2000	0.3975
TUDD	0.0694	0.1612	0.3210
TURP	0.9913	0.3112	0.6133
TURY	-1.1468	0.2774	0.5482
TUTU	0.1482	0.3112	0.6133
TUYT	-0.3963	0.2792	0.5517
UNYE	-0.9166	0.2810	0.5552
USS	-1.3349	0.2657	0.5256
VAKY	-0.3777	0.3614	0.7090
VES	-1.7961	0.2391	0.4738
VKL	-1.3791	0.3246	0.6389
YAS	-0.1664	0.1633	0.3252
YKB	-0.4164	0.1841	0.3662
YUN	-1.4667	0.2274	0.4512

"*" represents significance at 5% level.

TABLE A.10
WEEKLY DATA
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
AAA	0.2946*	708*	13224*	13932*	2.0399	0.0671
AAC	0.3511*	618*	11281*	11899*	2.3316	0.0251
ABA	0.9621	2	18*	19*	4.0198	0.4012*
AFC	0.9591	0	44*	44*	3.7766	0.1252
AKA	0.9496*	11*	100*	111*	4.2450	0.1731*
AKB	0.8859*	13*	254*	267*	3.8133	0.1238
AKC	0.8770*	77*	1630*	1707*	5.1147	0.1077*
AKS	0.8916*	0	685*	685*	3.9739	0.0892*
ALAK	0.8120*	915*	15705*	16620*	4.3951	0.1242
ALAS	0.9783	1	18*	19*	3.7556	0.2787*
ALTY	0.9098*	6*	22*	28*	3.0042	0.3090*
ANA	0.9742	25*	405*	430*	4.4247	0.0894
ARC	0.7584*	347*	3440*	3787*	4.3085	0.0499
ASEL	0.9614*	5*	138*	143*	5.4173	0.0911
AYG	0.7103*	204*	2298*	2502*	4.2660	0.1311
BAG	0.5932*	1319*	28100*	29419*	3.6884	0.0743
BOL	0.7764*	407*	6141*	6548*	5.3763	0.0805
BRI	0.9131*	67*	1089*	1156*	3.7835	0.1111
CAN	0.9390*	12*	351*	363*	5.7686	0.2093*
CEL	0.7896*	302*	3218*	3520*	5.2743	0.0945
CIMS	0.8867*	64*	1377*	1441*	4.5746	0.0478
CUK	0.7894*	268*	2933*	3201*	8.5245*	0.0746
DEM	0.7696*	93*	563*	656*	6.1127	0.0995
DEN	0.9285*	0	532*	532*	5.0152	0.1737*
DEVA	0.7806*	283*	4482*	4765*	3.3302	0.1152
DOG	0.8843*	54*	1072*	1126*	3.7242	0.2275*
DOK	0.8724*	162*	1987*	2149*	6.6524	0.0619
ECZ	0.7549*	554*	11709*	12263*	5.4199	0.0752
ECZI	0.7287*	211*	2412*	2623*	4.2645	0.0934
EGEB	0.8877*	181*	4452*	4633*	5.2543	0.0825
EGEE	0.6426*	354*	4284*	4638*	3.1286	0.0598
EGEG	0.8268*	266*	4995*	5261*	4.6109	0.0984
EMEK	0.8860*	18*	244*	262*	4.0828	0.2563*
ENK	0.9339*	9*	251*	260*	4.7862	0.2054*
ERC	0.6451*	91*	3255*	3347*	3.2616	0.1262
ERE	0.6274*	1720*	58605*	60325*	3.4642	0.1089*
FIN	0.7289*	229*	2510*	2739*	4.2683	0.1263
GEN	0.8284*	131*	1382*	1513*	3.7559	0.0953
GOOD	0.9235*	18*	581*	599*	4.0243	0.1107*

"*" represents significance at 5% . (table con'd)

TABLE A.10
WEEKLY DATA
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
GOR	0.8131*	109*	1240*	1349*	3.8820	0.2250*
GUB	0.9287*	16*	527*	543*	3.6584	0.0911
GUN	0.9591*	14*	599*	613*	5.1073	0.0681
HEK	0.8993*	99*	1146*	1245*	4.4653	0.1025
HURG	0.8502*	10*	53*	63*	2.8366	0.2026*
IKT	0.9635*	0	162*	162*	5.8770	0.1830*
INT	0.8817*	65*	700*	765*	3.8769	0.0613
ISM	0.7709*	62*	885*	948*	3.7607	0.1294
IZM	0.9555*	5*	480*	485*	5.8941	0.0541
IZO	0.7923*	375*	5629*	6004*	4.0506	0.0551
KAR	0.7949*	341*	5250*	5591*	4.7560	0.0477
KAV	0.8742*	107*	1222*	1229*	5.4258	0.0607
KEL	0.8883*	38*	595*	633*	5.1963	0.1577
KEN	0.3402*	338*	4503*	4841*	1.7498	0.1809
KEP	0.8925*	116*	1526*	1642*	3.7690	0.0480
KOCH	0.8393*	267*	4385*	4652*	4.2276	0.0852
KOCY	0.8980*	127*	1960*	2087*	4.4007	0.0624
KON	0.9893	0	54*	54*	2.5683	0.0944
KORD	0.9373*	23*	415*	438*	3.8236	0.1099*
KORU	0.8444*	390*	9945*	10335*	3.6212	0.0697
KOY	0.6798*	836*	24030*	24865*	3.9102	0.0908
KUT	0.9711	7*	107*	114*	4.0749	0.1340
MAK	0.7842*	66*	3991*	4057*	4.4812	0.0572
MARE	0.9597*	5*	278*	283*	5.6281	0.0969
MARM	0.9540*	0	303*	303*	4.5959	0.0693
MARMA	0.9412*	19*	422*	441*	4.2190	0.1316
MBV	0.8410*	102*	1334*	1436*	3.5242	0.1889*
MEN	0.8597*	89*	1077*	1166*	5.6273	0.1381*
MIG	0.6739*	235*	3280*	3515*	3.6535	0.2265*
NAS	0.8848*	41*	1619*	1660*	6.0634	0.1431*
NET	0.9307*	0	292*	292*	4.2872	0.1376*
NETH	0.9698	0	196*	196*	3.6695	0.1331
NETT	0.5568*	83*	589*	672*	2.9437	0.2088
NIG	0.9076*	14*	88*	102*	2.6690	0.1942
OKAN	0.9230*	31*	443*	474*	5.2172	0.1082
OLM	0.8206*	370*	8575*	8945*	4.5273	0.0746
OTO	0.9642*	9*	211*	220*	4.3681	0.0707
PAR	0.8752*	54*	604*	658*	4.7185	0.1681
PEG	0.9528*	5*	287*	293*	3.7292	0.0917
PET	0.9174*	20*	495*	515*	4.2247	0.0936

"*" represents significance at 5% level. (table con'd)

TABLE A.10
WEEKLY DATA
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
PETR	0.8923*	8*	145*	153*	2.9564	0.1900
PIN	0.8661*	207*	3980*	4187*	7.6562	0.1211*
PINE	0.9613*	0	210*	210*	4.9510	0.0850
PINSU	0.9663*	0	244*	244*	4.6518	0.2352*
PINU	0.9557*	0	252*	252*	5.0137	0.1856*
PMA	0.9570*	25*	290*	315*	4.5594	0.1210
POAS	0.9389*	5*	28*	33*	4.0739	0.2116*
RAB	0.8283*	182*	3487*	3669*	5.1609	0.0995
SANT	0.5978*	424*	6437*	6861*	4.5450	0.1286
SAR	0.7056*	951*	22238*	23189*	4.5334	0.0570
SIF	0.9455*	16*	497*	513*	3.3016	0.0796
SKS	0.9395*	25*	400*	425*	6.4999	0.1064
SON	0.8325*	0	96*	96*	2.8563	0.1209
SUNE	0.8228*	53*	761*	814*	3.1468	0.1054
TAMSI	0.9618*	0	233*	233*	3.5673	0.0932
TDT	0.9425	12*	263*	275*	2.7709	0.0668
TEL	0.9214*	83*	1771*	1854*	4.8338	0.1456*
TGAR	0.8749*	41*	530*	571*	3.1125	0.1107
TIB	0.9391*	0	756*	756*	4.7213	0.1349*
TIR	0.9155*	9*	62*	71*	3.0229	0.2364
TKB	0.9110*	25*	176*	200*	3.8156	0.0915
TOF	0.9268*	15*	86*	101*	3.1575	0.1539
TOFO	0.9497*	0	65*	65*	3.3795	0.1687
TRK	0.9453*	1*	131*	132*	3.1404	0.1011
TSI	0.8709*	138*	1518*	1656*	5.3585	0.0615
TSIC	0.8904*	172*	3697*	3869*	3.8108	0.1005
TSKB	0.9079*	41*	503*	544*	3.4750	0.0748
TUDD	0.9343*	39*	587*	626*	5.0719	0.1533*
TURP	0.9561*	3	28*	31*	4.9180	0.2114*
TURY	0.9014*	4	140*	144*	4.0740	0.1928*
TUTU	0.9619*	0	40*	40*	3.2627	0.1347
TUYT	0.7927*	51*	429*	480*	3.6415	0.1484
UNYE	0.9047*	11*	245*	256*	3.2672	0.1083
USS	0.8374*	55*	864*	919*	4.5058	0.1852*
VAKY	0.9759	0	34*	34*	3.9173	0.2648*
VES	0.9261*	28*	357*	385*	4.7284	0.1024
VKL	0.6024*	147*	1408*	1554*	3.7530	0.0868
YAS	0.9439*	32*	607*	639*	7.3808	0.0961
YKB	0.8812*	3	768*	771*	4.4323	0.1726*
YUN	0.8724*	97*	1339*	1436*	2.6277	0.0841

"*" represents significance at 5% level.

TABLE A.11
WEEKLY DATA
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
AAA	0.015	0.096	0.108
AAC	0.020	0.038	3.885*
ABA	1.819	1.341	5.384*
AFC	2.322	1.875	0.160
AKA	20.835*	7.302*	0.288
AKB	1.461	0.006	0.030
AKC	0.000	0.827	3.805
AKS	10.197*	0.358	0.033
ALAK	0.084	0.124	2.852
ALAS	0.561	0.000	0.261
ALTY	1.451	2.642	2.238
ANA	0.203	1.303	0.561
ARC	0.006	1.925	0.012
ASEL	9.133*	3.531	0.406
AYG	0.012	1.780	2.005
BAG	0.042	0.042	0.272
BOL	0.014	0.244	0.556
BRI	0.038	0.766	1.586
CAN	0.003	0.215	2.915
CEL	0.206	0.030	0.621
CIMS	1.545	0.141	0.157
CUK	0.003	1.016	0.000
DEM	0.089	0.152	0.028
DEN	0.676	0.990	0.366
DEVA	0.008	0.000	0.007
DOG	0.007	0.202	1.179
DOK	0.003	0.389	0.007
ECZ	0.061	0.819	0.637
ECZI	0.052	0.033	7.086
EGEB	0.892	4.614*	0.897
EGEE	0.028	0.001	0.485
EGEG	0.125	0.077	0.017
EMEK	0.284	0.006	0.107
ENK	0.051	0.140	0.618
ERC	0.050	0.057	3.071
ERE	0.014	0.102	0.001
FIN	0.001	1.654	0.430
GEN	0.018	0.079	1.842
GOOD	10.614*	0.001	1.287

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

(table con'd)

TABLE A.11
WEEKLY DATA
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
GOR	0.044	0.149	0.038
GUB	2.060	2.924	0.681
GUN	1.158	3.102	0.006
HEK	0.912	0.093	0.618
HURG	0.000	0.033	0.605
IKT	0.717	1.842	0.792
INT	0.030	3.520	4.251*
ISM	0.147	0.000	0.007
IZM	9.812*	0.081	0.236
IZO	0.002	2.632	1.847
KAR	0.118	0.679	0.001
KAV	0.119	0.356	0.240
KEL	0.001	0.060	0.102
KEN	0.540	4.223*	8.911*
KEP	0.081	0.120	1.101
KOCH	0.071	0.039	0.601
KOCY	0.007	0.417	0.183
KON	1.562	0.001	0.071
KORD	2.402	2.549	1.591
KORU	0.066	0.562	0.337
KOY	0.011	0.102	1.271
KUT	0.871	0.657	3.890*
MAK	0.002	0.871	0.500
MARE	0.520	0.062	0.378
MARM	1.093	0.268	0.788
MARMA	0.002	3.694	0.261
MBV	0.008	0.478	1.872
MEN	0.006	0.003	1.354
MIG	0.033	1.764	0.273
NAS	0.528	0.541	0.152
NET	9.525*	12.430*	2.334
NETH	0.609	2.655	1.551
NETT	0.022	0.111	0.022
NIG	0.060	0.026	0.095
OKAN	1.275	2.020	2.058
OLM	0.007	0.554	0.871
OTO	1.076	0.015	0.071
PAR	0.012	0.107	0.337
PEG	0.007	0.037	1.325
PET	1.671	2.035	0.109

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

(table con'd)

TABLE A.11
WEEKLY DATA
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
PETR	1.807	0.554	0.109
PIN	0.103	2.158	0.038
PINE	3.009	14.706*	14.993*
PINSU	15.602*	9.791*	1.824
PINU	0.746	1.067	5.588*
PMA	0.264	0.029	0.286
POAS	4.023*	10.536*	6.158*
RAB	0.006	0.772	8.690*
SANT	0.025	0.122	0.037
SAR	0.036	0.302	0.998
SIF	0.357	0.001	0.004
SKS	0.025	0.351	3.182
SON	6.883*	6.651*	1.630
SUNE	0.025	0.146	3.439
TAMSI	0.495	0.696	4.464*
TDT	0.022	0.081	0.174
TEL	0.019	0.029	2.299
TGAR	0.040	1.505	11.403*
TIB	1.832	0.097	0.069
TIR	3.743	7.476*	1.018
TKB	0.080	0.531	3.138
TOF	0.250	0.361	1.168
TOFO	0.074	0.014	1.000
TRK	0.586	0.912	0.079
TSI	0.005	0.059	0.082
TSIC	0.014	0.517	0.484
TSKB	5.043*	4.891*	1.404
TUDD	0.732	2.614	0.600
TURP	0.072	1.808	4.414*
TURY	0.177	0.781	6.068*
TUTU	6.396*	0.810	0.852
TUYT	0.000	0.682	0.419
UNYE	0.693	0.094	0.806
USS	0.009	0.276	0.791
VAKY	0.513	0.024	0.411
VES	0.374	0.114	0.077
VKL	0.016	0.218	3.487
YAS	0.013	0.386	0.232
YKB	0.530	3.602	5.730*
YUN	0.004	0.031	0.768

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

TABLE A.12
WEEKLY DATA
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$	AUTOCORRELATION FOR LAG -1 D	D^2	$\|D\|$
AAA	1.77	0.10	0.17	-0.035	-0.015	-0.026
AAC	1.62	0.11	0.50	0.007	-0.016	-0.036
ABA	11.80	12.59*	19.08*	-0.237	-0.147	-0.175
AFC	2.57	6.07	6.61	0.008	0.192	0.161
AKA	7.51	77.91*	55.21*	0.100	0.448*	0.227
AKB	5.71	1.59	12.95*	-0.132	0.108	0.266*
AKC	10.00	1.02	4.66	0.100	0.013	0.110
AKS	3.34	32.80*	17.79*	-0.049	0.361*	0.302*
ALAK	7.70	0.49	4.00	0.092	-0.021	0.015
ALAS	4.68	4.90	1.64	-0.139	-0.080	-0.049
ALTY	9.79	6.38	9.76	0.330*	0.223*	0.345*
ANA	6.73	0.63	1.60	0.006	-0.033	-0.020
ARC	1.00	0.86	2.59	-0.022	-0.006	0.072
ASEL	3.53	10.49	11.20	0.043	0.279*	0.256
AYG	3.59	0.51	7.06	-0.139	0.020	0.148
BAG	2.55	0.16	2.52	0.088	-0.008	0.018
BOL	2.59	0.52	3.99	0.028	-0.012	0.027
BRI	5.52	1.25	4.69	-0.111	0.055	0.114
CAN	12.09	0.81	7.62	0.199*	0.072	0.103
CEL	7.50	1.07	4.72	0.081	-0.028	-0.021
CIMS	1.18	1.68	8.52	0.004	0.078	0.163*
CUK	5.09	0.86	6.39	0.018	-0.004	0.039
DEM	3.20	1.83	3.75	-0.042	-0.020	0.059
DEN	9.09	2.06	6.01	0.221*	0.079	0.180*
DEVA	5.72	0.89	5.34	0.077	-0.020	0.031
DOG	18.37*	0.80	10.12	0.283*	0.070	0.052
DOK	8.14	0.15	22.18*	0.081	0.002	0.248*
ECZ	4.06	0.62	13.20*	-0.070	0.030	0.184*
ECZI	2.38	0.23	1.25	-0.010	-0.026	-0.057
EGEB	7.81	6.08	23.41*	-0.051	0.061	0.205*
EGEE	0.94	0.12	3.64	0.017	-0.016	0.021
EGEG	5.54	0.34	4.55	0.100	-0.008	0.047
EMEK	11.55	7.01	6.53	0.284*	0.006	0.112
ENK	18.04*	2.45	6.29	0.255*	0.058	0.123
ERC	4.91	0.23	2.00	0.038	-0.012	0.050
ERE	6.46	0.23	5.16	0.098	-0.008	0.011
FIN	4.68	0.15	1.39	-0.105	-0.013	0.012
GEN	7.14	0.55	6.21	-0.009	-0.012	-0.001
GOOD	12.43	19.62*	37.68*	-0.072	0.239	0.290

"*" represents significance at 5% level.

$X^2(6)=12.5916$

(table con'd)

TABLE A.12
WEEKLY DATA
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6)	LB(6)	LB(6)	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$	D	D^2	$\|D\|$
GOR	5.84	0.59	3.85	0.209*	0.068	0.143
GUB	5.17	4.39	5.94	0.110	0.106	0.071
GUN	6.52	14.73*	20.25*	-0.008	0.088	0.215*
HEK	2.71	3.39	9.72	0.088	0.102	0.147
HURG	10.78	0.76	2.30	-0.256*	-0.085	-0.026
IKT	9.61	25.22*	19.72*	-0.181*	0.067	0.159
INT	3.06	0.72	5.38	-0.016	0.015	0.060
ISM	3.28	0.37	1.41	-0.024	-0.048	-0.104
IZM	1.88	16.78*	40.60*	-0.016	0.209*	0.209*
IZO	1.59	0.57	2.26	-0.023	-0.003	0.024
KAR	3.05	0.59	1.78	-0.038	-0.023	-0.007
KAV	5.06	1.39	2.77	-0.045	-0.019	-0.033
KEL	7.24	2.02	10.28	-0.055	0.003	0.116
KEN	2.88	0.28	2.31	0.218*	0.042	0.175*
KEP	1.81	1.36	8.36	0.031	0.016	0.138
KOCH	4.93	2.03	6.76	0.078	-0.024	-0.010
KOCY	1.61	0.60	3.62	0.041	-0.006	0.084
KON	2.81	5.88	12.39	0.099	0.112	0.142
KORD	5.03	4.26	20.49*	-0.097	0.098	0.214
KORU	5.50	0.31	3.26	-0.022	-0.017	-0.017
KOY	6.19	0.10	1.03	0.089	-0.008	0.041
KUT	5.15	8.03	14.59*	0.062	-0.090	-0.153
MAK	0.92	0.21	1.82	0.024	0.006	0.093
MARE	11.08	3.70	5.73	0.022	0.053	0.064
MARM	5.84	23.37*	38.44*	-0.036	0.067	0.166
MARMA	13.07*	3.79	10.66	-0.067	0.005	-0.064
MBV	5.28	0.28	4.06	0.191	0.030	0.124
MEN	9.21	0.90	9.68	-0.173	0.026	0.102
MIG	9.20	0.36	4.47	-0.276*	0.051	0.213*
NAS	12.94*	0.85	6.10	0.124	0.030	0.098
NET	8.28	17.45*	23.32*	-0.162	0.257*	0.307*
NETH	6.35	2.66	2.18	0.103	-0.056	-0.029
NETT	16.67*	3.23	12.21	-0.124	0.021	0.183
NIG	8.67	6.17	5.90	-0.223*	0.041	-0.064
OKAN	5.18	1.15	4.16	-0.102	0.064	0.141
OLM	3.32	0.58	8.58	0.037	0.021	0.098
OTO	1.22	5.10	5.32	0.054	-0.052	-0.018
PAR	8.61	0.99	2.79	0.183*	0.100	0.146
PEG	2.26	1.92	5.70	-0.039	0.017	0.095
PET	11.20	8.73	22.95*	0.028	0.120	0.224

"*" represents significance at 5% level.

$X^2(6)=12.5916$

(table con'd)

TABLE A.12
WEEKLY DATA
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6)	LB(6)	LB(6)	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$	D	D^2	$\|D\|$
PETR	5.34	9.19	11.05	-0.244*	0.381*	0.391*
PIN	4.69	1.66	13.93*	-0.107	0.024	0.117
PINE	6.49	7.13	9.71	0.002	0.129	0.119
PINSU	24.76*	78.51*	58.27*	-0.288*	0.478*	0.379*
PINU	12.64*	23.44*	30.56*	0.173	0.146	0.332
PMA	5.72	3.59	3.66	0.121	0.094	0.067
POAS	7.12	8.73	7.78	0.191	0.311*	0.183
RAB	5.14	0.26	9.27	0.077	-0.001	0.116
SANT	3.57	0.28	0.44	0.112	-0.015	0.030
SAR	1.78	0.23	2.35	0.024	-0.011	0.014
SIF	1.72	1.30	3.54	-0.080	-0.029	-0.051
SKS	3.57	1.15	6.33	-0.060	-0.023	0.067
SON	1.83	8.27	9.84	-0.050	0.468*	0.486*
SUNE	2.52	0.43	3.12	-0.055	-0.011	0.031
TAMSI	1.99	1.09	3.52	0.053	-0.060	-0.116
TDT	1.45	4.71	11.50	-0.036	-0.031	0.027
TEL	12.82*	1.09	5.27	0.180	0.056	0.136
TGAR	3.53	0.94	4.88	0.053	-0.013	0.080
TIB	8.37	6.81	14.42*	-0.133	0.152	0.183
TIR	3.77	8.26*	11.68	0.264*	0.421*	0.478*
TKB	4.46	0.43	0.42	0.035	-0.005	-0.019
TOF	3.28	1.72	2.51	-0.143	0.066	0.055
TOFO	5.96	7.48	5.30	-0.090	0.126	0.063
TRK	1.28	1.77	1.41	0.088	-0.054	-0.041
TSI	5.13	2.51	13.48*	0.019	0.026	0.127
TSIC	3.95	0.34	6.35	0.056	0.024	0.141
TSKB	2.17	16.35*	23.80*	0.045	0.185*	0.260*
TUDD	12.68*	1.76	9.35	0.172	0.070	0.169
TURP	9.93	2.79	3.09	0.134	0.063	0.048
TURY	7.41	0.97	1.66	-0.235	-0.030	0.081
TUTU	4.54	9.51	7.57	-0.030	0.328	0.252
TUYT	2.19	1.33	7.25	-0.098	0.022	0.153
UNYE	1.13	1.94	5.91	0.018	0.110	0.184*
USS	6.37	0.88	9.05	-0.183*	0.046	0.243
VAKY	9.36	3.96	6.91	-0.201*	0.085	0.138
VES	3.98	1.15	5.80	0.036	-0.053	-0.012
VKL	3.07	0.24	1.75	-0.133	-0.024	0.059
YAS	7.74	0.87	2.53	-0.014	0.005	0.087
YKB	12.91*	5.95	10.56	0.128	0.099	0.104
YUN	2.50	0.58	3.37	0.060	0.034	0.089

"*" represents significance at 5% level.

$X^2(6)=12.5916$

TABLE A.13
DAILY DATA (BEFORE AUGUST 11, 1989)
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
AKC	-0.0056	0.0770	-9.8458	142.6860	1.2870
ALAK	-0.0051	0.0205	-1.5469	4.3856	0.1104
ANA	-0.0013	0.0440	-0.7919	4.4019	0.3713
ARC	-0.0012	0.0510	-4.8877	47.0355	0.6195
BAG	-0.0043	0.0981	-14.2081	250.8059	1.8499
BOL	0.0012	0.0396	0.1127	0.6796	0.2093
BRI	-0.0018	0.0587	-6.3579	66.5596	0.7511
CAN	-0.0031	0.0713	-0.5156	0.2892	0.3350
CEL	-0.0021	0.0600	-7.4423	85.2299	0.8378
CIMS	-0.0041	0.0604	-3.8139	30.4600	0.6698
CUK	0.0003	0.0500	-6.1159	84.2965	0.8575
DEN	-0.0071	0.0491	-1.2271	4.4702	0.3317
DEVA	-0.0083	0.0860	-7.2329	65.7010	0.9463
DOK	-0.0037	0.0630	-7.9789	105.6155	0.9985
ECZ	-0.0019	0.0452	-2.9982	23.6784	0.5021
EGEB	0.0034	0.0383	0.5764	1.0059	0.2550
EGEG	-0.0044	0.0632	-7.9830	114.1739	1.0530
ENK	-0.0048	0.0768	-2.8936	19.4205	0.7409
ERE	0.0042	0.0410	0.3316	4.4726	0.4315
GOOD	-0.0031	0.0540	-6.6612	92.6414	0.8751
GUB	-0.0041	0.0437	-0.7086	2.0694	0.2982
GUN	0.0019	0.0467	-0.1845	0.4744	0.2943
HEK	0.0005	0.0352	-0.3444	2.0964	0.2559
IZM	-0.0026	0.0551	-3.1610	29.8400	0.6704
IZO	-0.0029	0.0681	-9.5962	142.0442	1.1227
KAR	-0.0016	0.0510	-10.5294	170.9407	0.9205
KAV	-0.0021	0.0663	-8.1932	115.0768	1.0437
KEP	-0.0031	0.0478	-3.6246	30.9865	0.5571
KOCH	-0.0021	0.0445	-2.0025	15.4151	0.4811
KOCY	-0.0024	0.0478	-6.3105	66.9435	0.6286
KORD	-0.0031	0.0517	-4.0008	32.8325	0.6096
KORU	-0.0000	0.0441	-2.4987	24.4818	0.6085
KOY	-0.0025	0.0483	-1.6617	6.9457	0.3317
MARE	-0.0021	0.0433	-0.2531	0.6286	0.2007
MARM	-0.0016	0.0383	2.0411	19.1314	0.4521
MEN	-0.0129	0.1345	-5.1224	32.4201	1.1236
NAS	-0.0031	0.0631	-5.2836	61.9109	0.9209
NET	-0.0012	0.0611	-6.9129	51.5129	0.5127

(table con'd)

TABLE A.13
DAILY DATA (BEFORE AUGUST 11, 1989)
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
OLM	-0.0041	0.0540	-2.5470	21.9058	0.6294
OTO	-0.0004	0.0399	-0.3032	1.6162	0.2843
PIN	0.0006	0.0368	-0.8784	6.0561	0.3434
PINE	-0.0067	0.0597	-1.2150	5.5712	0.4484
PINSU	-0.0023	0.0600	0.0633	1.1322	0.4756
PINU	-0.0060	0.1666	-4.1334	22.2693	1.1641
PMA	-0.0025	0.0624	-1.3203	5.0624	0.4660
RAB	-0.0023	0.0487	-6.9447	91.4790	0.7820
SAR	-0.0006	0.0483	-5.2282	65.5931	0.7296
SIF	-0.0055	0.0822	-5.7708	50.9247	0.8881
TEL	-0.0019	0.0396	-2.5432	32.9635	0.6351
TIB	-0.0012	0.0400	-1.1951	9.5665	0.4201
TSI	-0.0049	0.0624	-7.5964	102.1028	0.9703
TSIC	0.0001	0.0433	-1.8092	14.9972	0.4805
TSKB	0.0050	0.0747	-0.1758	6.3988	0.5753
TUDD	-0.0027	0.0470	-6.2925	85.2236	0.7450
YAS	-0.0006	0.0556	-7.4606	100.7196	0.8766
YKB	-0.0021	0.0877	-5.0931	39.7041	0.8425

TABLE A.14
DAILY DATA (AFTER AUGUST 11, 1989)
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
AKC	0.0007	0.0494	-3.0396	40.8072	0.7620
ALAK	0.0025	0.0767	-7.9290	123.0858	1.4362
ANA	-0.0003	0.0584	-2.0978	20.0379	0.7762
ARC	0.0008	0.0676	-7.1004	85.9597	1.0123
BAG	-0.0007	0.0690	-10.9078	219.0002	1.5453
BOL	-0.0038	0.0897	-9.1369	122.4346	1.4627
BRI	-0.0005	0.0581	-3.8669	56.5228	0.9888
CAN	0.0021	0.0753	-4.7170	64.8244	1.2672
CEL	-0.0003	0.0561	-4.1002	48.1742	0.8008
CIMS	0.0008	0.0564	-5.4394	87.8020	1.0320
CUK	-0.0011	0.0623	-5.5645	63.5237	1.0547
DEN	-0.0006	0.0662	-2.7407	32.9976	1.0245
DEVA	0.0004	0.0791	-9.6860	165.1746	1.6331
DOK	0.0011	0.0642	-4.7535	56.2187	0.9967
ECZ	0.0012	0.0985	-7.2372	109.6700	2.3230
EGEB	0.0041	0.0589	-7.6793	136.1831	1.1724
EGEG	-0.0012	0.0646	-4.7724	73.8415	1.1408
ENK	0.0019	0.0676	-3.0569	25.6562	0.7756
ERE	-0.0025	0.0888	-16.3810	364.6024	2.1620
GOOD	0.0007	0.0608	-3.1139	35.2172	0.9006
GUB	0.0001	0.0472	0.0143	0.1191	0.2926
GUN	0.0035	0.0532	-3.0739	39.3398	0.8266
HEK	-0.0020	0.0653	-3.4869	33.2214	0.8450
IZM	-0.0007	0.0639	-3.2192	43.3478	1.0172
IZO	0.0012	0.0633	-4.6401	49.9474	0.8894
KAR	-0.0008	0.0584	-3.5699	44.0721	0.8376
KAV	-0.0023	0.0675	-4.9075	50.8277	0.9032
KEP	0.0000	0.0650	-3.8256	43.5355	1.0839
KOCH	0.0014	0.0686	-7.4701	103.1764	1.1977
KOCY	0.0026	0.0567	-3.8226	45.1856	0.9119
KORD	-0.0000	0.0482	-1.8831	15.7280	0.5620
KORU	-0.0023	0.0674	-8.3996	155.4265	1.3884
KOY	-0.0004	0.0899	-14.1741	309.7068	2.0996
MARE	0.0011	0.0584	-1.6477	13.3736	0.7007
MARM	0.0002	0.0527	-0.0872	0.4970	0.4303
MEN	-0.0011	0.0681	-5.9641	88.9077	1.2186
NAS	-0.0008	0.0592	-0.2280	2.5987	0.5191
NET	-0.0015	0.0567	-1.3697	11.6831	0.7093
OLM	-0.0015	0.0699	-7.7071	135.9574	1.3871
OTO	0.0016	0.0564	-1.6033	10.6450	0.5718
PIN	-0.0006	0.0649	-3.5539	43.9178	1.0111
PINE	0.0010	0.0527	-0.3088	2.1051	0.5046
PINSU	0.0004	0.0575	-0.0525	0.0966	0.3750
PINU	0.0027	0.0596	-0.0441	-0.5685	0.2507

(table con'd)

TABLE A.14
DAILY DATA (AFTER AUGUST 11, 1989)
DESCRIPTIVE STATISTICS

	mean	std dev	skewness	kurtosis	range
PMA	-0.0003	0.0605	-0.5180	2.5016	0.5658
RAB	-0.0009	0.0641	-3.8726	60.6690	1.3196
SAR	0.0008	0.0707	-13.9196	303.6996	1.6602
SIF	-0.0013	0.0626	-1.8881	15.7543	0.7989
TEL	0.0019	0.0582	-5.2348	82.0909	1.0583
TIB	0.0011	0.0586	-1.8356	15.6358	0.7061
TSI	0.0010	0.0644	-4.6841	56.7384	0.9935
TSIC	-0.0015	0.0707	-7.1177	113.0721	1.3329
TSKB	-0.0004	0.0530	-0.4558	2.1228	0.4304
TUDD	0.0016	0.0585	-2.9334	27.0532	0.7975
YAS	0.0001	0.0586	-1.7344	14.3977	0.6852
YKB	-0.0004	0.0538	-2.1613	19.3136	0.6595

TABLE A.15
DAILY DATA (BEFORE AUGUST 11, 1989)
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_o : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
AKC	-1.4644	0.1213	0.2420
ALAK	-1.5029	0.3925	0.7681
ANA	-0.5396	0.1325	0.2641
ARC	-0.4584	0.1229	0.2453
BAG	-0.8821	0.1223	0.2440
BOL	0.5509	0.1313	0.2619
BRI	-0.4302	0.1750	0.3482
CAN	-0.4046	0.2642	0.5226
CEL	-0.7123	0.1214	0.2422
CIMS	-1.3510	0.1220	0.2434
CUK	0.1241	0.1211	0.2417
DEN	-1.4261	0.2450	0.4853
DEVA	-1.2007	0.1955	0.3886
DOK	-0.1658	0.1236	0.2465
ECZ	-0.8084	0.1311	0.2615
EGEB	1.7733	0.1237	0.2468
EGEG	-1.3672	0.1253	0.2500
ENK	-0.7829	0.1961	0.3898
ERE	2.0769*	0.1219	0.2431
GOOD	-0.1401	0.1214	0.2422
GUB	-1.7709	0.1282	0.2557
GUN	0.6905	0.1426	0.2843
HEK	0.2908	0.1287	0.2568
IZM	-0.9310	0.1242	0.2478
IZO	-0.7829	0.1315	0.2622
KAR	-0.6353	0.1211	0.2417
KAV	-0.5780	0.1313	0.2619
KEP	-1.1894	0.1319	0.2630
KOCH	-0.9344	0.1234	0.2462
KOCY	-0.9973	0.1220	0.2434
KORD	-1.2240	0.1211	0.2417
KORU	-0.0210	0.1226	0.2447
KOY	-0.5843	0.2132	0.4233
MARE	-0.6712	0.1801	0.3583
MARM	-0.8031	0.1279	0.2550
MEN	-1.0383	0.2246	0.4455
NAS	-0.9594	0.1255	0.2503
NET	-0.1498	0.3112	0.6133
OLM	-1.4814	0.1265	0.2523

"*" represents significance at 5% .

(table con'd)

TABLE A.15
DAILY DATA (BEFORE AUGUST 11, 1989)
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND
STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
OTO	-0.1874	0.1245	0.2484
PIN	0.3054	0.1361	0.2713
PINE	-1.4733	0.1841	0.3662
PINSU	-0.5847	0.1595	0.3176
PINU	-0.2344	0.3695	0.7245
PMA	-0.5635	0.1745	0.3473
RAB	-0.9589	0.1211	0.2417
SANT	1.0462	0.0953	0.1904
SAR	-0.2575	0.1237	0.2468
SIF	-0.8984	0.0167	0.1821
TEL	-0.8777	0.1311	0.2615
TIB	-0.5654	0.1298	0.2589
TSI	-1.4617	0.1315	0.2622
TSIC	0.0640	0.1244	0.2481
TSKB	0.5099	0.3190	0.6283
TUDD	-1.1485	0.1213	0.2420
YAS	-0.2306	0.1247	0.2487
YKB	-0.2881	0.2070	0.4112

"*" represents significance at 5% level.

TABLE A.16
DAILY DATA (AFTER AUGUST 11, 1989)
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_0 : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
AKC	0.3733	0.0895	0.1788
ALAK	0.8725	0.0912	0.1821
ANA	-0.1490	0.0900	0.1798
ARC	0.3168	0.0896	0.1790
BAG	-0.2933	0.0898	0.1794
BOL	-1.1415	0.0912	0.1822
BRI	-0.2595	0.0895	0.1788
CAN	0.7023	0.0988	0.1972
CEL	-0.1361	0.0895	0.1788
CIMS	0.4078	0.0896	0.1789
CUK	-0.4903	0.0896	0.1790
DEN	-0.2383	0.0952	0.1901
DEVA	0.1333	0.0897	0.1792
DOK	0.4736	0.0899	0.1796
ECZ	0.3496	0.0897	0.1792
EGEB	1.8977	0.0896	0.1786
EGEG	-0.5044	0.0898	0.1794
ENK	0.7472	0.0925	0.1848
ERE	-0.7565	0.0895	0.1788
GOOD	0.3201	0.0896	0.1790
GUB	0.0476	0.0897	0.1791
GUN	1.8152	0.0896	0.1789
HEK	-0.8256	0.0897	0.1792
IZM	-0.3086	0.0895	0.1788
IZO	0.5121	0.0899	0.1796
KAR	-0.4209	0.0895	0.1788
KAV	-0.9225	0.0902	0.1801
KEP	0.0125	0.0905	0.1807
KOCH	0.5469	0.0895	0.1788
KOCY	1.2509	0.0895	0.1788
KORD	-0.0090	0.0895	0.1788
KORU	-0.9184	0.0895	0.1788
KOY	-0.1123	0.0899	0.1796
MARE	0.5037	0.0990	0.1797
MARM	0.0977	0.0908	0.1814
MEN	-0.4236	0.0906	0.1809
NAS	-0.3801	0.0898	0.1794
NET	-0.6838	0.0944	0.1884
OLM	-0.5770	0.0899	0.1795

"*" represents significance at 5% .

(table con'd)

TABLE A.16
DAILY DATA (AFTER AUGUST 11, 1989)
TEST OF EQUALITY OF POPULATION MEANS TO ZERO AND STANDARD ERRORS OF SKEWNESS AND KURTOSIS

	T $H_o : \mu = 0$	Standard error of skewness	Standard error of excess kurtosis
OTO	0.7825	0.0897	0.1792
PIN	-0.2466	0.0939	0.1875
PINE	0.4934	0.0918	0.1833
PINSU	0.1962	0.0928	0.1854
PINU	1.0478	0.1061	0.2118
PMA	0.1173	0.0987	0.1971
RAB	-0.3750	0.0913	0.1823
SANT	-1.0484	0.0895	0.1788
SAR	0.3036	0.0895	0.1788
SIF	-0.5418	0.0913	0.1823
TEL	0.8973	0.0895	0.1788
TIB	0.5079	0.0897	0.1792
TSI	0.4193	0.0897	0.1792
TSIC	-0.5764	0.0895	0.1788
TSKB	-0.2271	0.0910	0.1817
TUDD	0.7435	0.0895	0.1788
YAS	0.0557	0.0896	0.1789
YKB	-0.2136	0.0896	0.1790

"*" represents significance at 5% .

TABLE A.17
DAILY DATA
TESTS FOR EQUALITY OF TWO POPULATION VARIANCES

H_0: $\sigma^2_1 = \sigma^2_2$

	F	PROB>F
AKC	2.43*	0.00
ALAK	13.98*	0.00
ANA	1.76*	0.00
ARC	1.76*	0.00
BAG	2.02*	0.00
BOL	5.13*	0.00
BRI	1.02	0.82
CAN	1.11	0.55
CEL	1.15	0.12
CIMS	1.14	0.12
CUK	1.55*	0.00
DEN	1.82*	0.00
DEVA	1.18	0.17
DOK	1.04	0.68
ECZ	4.76*	0.00
EGEB	2.36*	0.00
EGEG	1.05	0.63
ENK	1.29*	0.03
ERE	4.69*	0.00
GOOD	1.27*	0.01
GUB	1.17	0.09
GUN	1.30*	0.01
HEK	3.45*	0.00
IZM	1.35*	0.00
IZO	1.16	0.10
KAR	1.11	0.23
KAV	1.04	0.71
KEP	1.85*	0.00
KOCH	2.38*	0.00
KOCY	1.41*	0.00
KORD	1.15	0.11
KORU	2.33*	0.00
KOY	3.45*	0.00
MARE	1.82*	0.00
MARM	1.89*	0.00
MEN	3.90*	0.00
NAS	1.14	0.15
NET	1.17	0.37
OLM	1.68*	0.00

"*" represents significance at 5% .

(table con'd)

TABLE A.17
DAILY DATA
TESTS FOR EQUALITY OF TWO POPULATION VARIANCES

	H_o: $\sigma^2_1 = \sigma^2_2$	
	F	PROB>F
OTO	2.00*	0.00
PIN	3.10*	0.00
PINE	1.28*	0.03
PINSU	1.09	0.40
PINU	7.82*	0.00
PMA	1.06	0.57
RAB	1.73*	0.00
SAR	2.15*	0.00
SIF	1.72*	0.00
TEL	2.16*	0.00
TIB	2.14*	0.00
TSI	1.07	0.48
TSIC	2.67*	0.00
TSKB	1.99*	0.00
TUDD	1.55*	0.00
YAS	1.11	0.24
YKB	2.66*	0.00

"*" represents significance at 5% .

TABLE A.18
DAILY DATA
TESTS FOR EQUALITY OF TWO POPULATION MEANS

	T $H_o: \mu_a=\mu_b$	PROB>T	W $H_o: \mu_a=\mu_b$
AKC	-1.4835	0.1385	1.6847
ALAK	-1.7106	0.0901	0.9964
ANA	-0.3012	0.7634	0.0228
ARC	-0.5499	0.5825	0.2463
BAG	-0.6496	0.5162	0.1828
BOL	1.2588	0.2084	1.5693
BRI	-0.2693	0.7878	0.0294
CAN	-0.6070	0.5440	0.8373
CEL	-0.5201	0.6031	0.1002
CIMS	-1.3726	0.1701	1.3039
CUK	0.4234	0.6721	0.2412
DEN	-1.1554	0.2497	0.0432
DEVA	-1.2229	0.2217	0.0044
DOK	-1.2117	0.2259	1.0741
ECZ	-0.7407	0.4590	0.3611
EGEB	-0.2252	0.8219	0.9351
EGEG	-0.7999	0.4240	0.1308
ENK	-1.0089	0.3142	1.1450
ERE	1.7466	0.0810	1.8914
GOOD	-1.0815	0.2797	0.8087
GUB	-1.4049	0.1603	0.8883
GUN	-0.4940	0.6215	1.5496
HEK	0.8309	0.4062	0.7448
IZM	-0.5168	0.6054	0.4520
IZO	-0.9609	0.3368	0.7023
KAR	-0.2390	0.8112	0.0038
KAV	0.0537	0.9572	0.1802
KEP	-0.8791	0.3796	0.2988
KOCH	-1.0307	0.3029	0.7965
KOCY	-1.5733	0.1160	2.4858
KORD	-1.0236	0.3062	0.5453
KORU	0.6693	0.5034	0.6799
KOY	-0.3919	0.6954	0.0185
MARE	-0.8381	0.4025	0.4816
MARM	-0.6433	0.5202	0.2578
MEN	-0.9333	0.3525	0.0057
NAS	-0.5972	0.5505	0.0778
NET	0.0400	0.9681	0.3659
OLM	-0.7001	0.4841	0.0474

"*" represents significance at 5% .

(table con'd)

TABLE A.18
DAILY DATA
TESTS FOR EQUALITY OF TWO POPULATION MEANS

	T $H_o: \mu_a = \mu_b$	PROB>T	W $H_o: \mu_a = \mu_b$
OTO	-0.6898	0.4905	0.6006
PIN	0.3845	0.7007	0.1243
PINE	-1.5474	0.1230	1.5064
PINSU	-0.6197	0.5356	0.2220
PINU	-0.3381	0.7370	0.5358
PMA	-0.5598	0.5758	0.1481
RAB	-0.4168	0.6769	0.0143
SAR	-0.3975	0.6911	0.1461
SIF	-0.6472	0.5181	0.8563
TEL	-1.2551	0.2097	1.3801
TIB	-0.7587	0.4482	0.4776
TSI	-1.4193	0.1561	1.3164
TSIC	0.4803	0.6311	0.3226
TSKB	0.5445	0.5881	0.1183
TUDD	-1.3490	0.1776	1.5219
YAS	-0.2139	0.8307	0.0186
YKB	-0.2240	0.8231	0.0181

"*" represents significance at 5%

TABLE A.19
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
AKC	0.5146*	6537*	358871*	365408*	5.1224	0.0461
ALAK	0.8234*	14*	84*	98*	3.6501	0.2649*
ANA	0.9261*	35*	774*	809*	7.2730	0.0536
ARC	0.6933*	1570*	41178*	42748*	4.7375	0.1273*
BAG	0.3832*	13400*	1070452*	1083852*	3.2925	0.0331
BOL	0.9520*	1	194*	195*	5.0575	0.0705*
BRI	0.6256*	1305*	39088*	40393*	3.0863	0.0738
CAN	0.9256*	3	37*	40*	6.1919	0.4049*
CEL	0.5773*	3732*	131300*	135032*	5.0560	0.0787*
CIMS	0.7667*	966*	18682*	19648*	6.8998	0.1462*
CUK	0.7309*	2538*	129190*	131723*	7.0851	0.0915*
DEN	0.8551*	24*	227*	251*	7.5090	0.1448*
DEVA	0.4364*	52*	30443*	31785*	3.5721	0.0519
DOK	0.6102*	4137*	192114*	196251*	3.7416	0.0823*
ECZ	0.8155*	518*	10281*	10799*	4.7234	0.1014*
EGEB	0.9637*	0	260*	260*	5.2601	0.0798*
EGEG	0.6561*	4023*	217298*	221321*	5.4003	0.0863*
ENK	0.8005*	213*	3215*	3428*	5.4117	0.1401*
ERE	0.9647*	7*	933*	939*	9.7589*	0.1301*
GOOD	0.7211*	2987*	154304*	157291*	4.8171	0.0918*
GUB	0.9357*	29*	387*	416*	4.3592	0.0600
GUN	0.9729*	2	146*	148*	5.5069	0.0834*
HEK	0.9453*	7*	388*	395*	6.0543	0.0428
IZM	0.8449*	641*	17371*	18012*	4.9746	0.0719*
IZO	0.5678*	5285*	302302*	307587*	3.3388	0.1124*
KAR	0.5414*	7514*	512988*	520502*	3.9091	0.0424
KAV	0.6336*	3865*	200909*	204774*	3.9552	0.0349
KEP	0.7712*	747*	16495*	17242*	4.2012	0.0634
KOCH	0.8818*	260*	5532*	5792*	7.2342	0.0939*
KOCY	0.6261*	2655*	81707*	84362*	6.4997	0.0622
KORD	0.7455*	1081*	21754*	22835*	5.6413	0.0358
KORU	0.8578*	413*	12482*	12895*	5.2219	0.0838*
KOY	0.8142*	59*	534*	593*	4.4259	0.1338*
MARE	0.9021*	2	102*	102*	4.8177	0.1279*
MARM	0.8515*	255*	7443*	7698*	6.6908	0.0879*
MEN	0.5328*	504*	6079*	6583*	4.1278	0.0673
NAS	0.7514*	1757*	66488*	68245*	4.1433	0.0516
NET	0.3403*	477*	7423*	7900*	1.9663	0.0752
OLM	0.8764*	399*	9627*	10026*	5.3817	0.1171*

"*" represents significance at 5% .

(table con'd)

TABLE A.19
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
OTO	0.9684*	6*	340*	346*	5.5641	0.0841*
PIN	0.9210*	42*	1098*	1140*	6.2425	0.1013*
PINE	0.9193*	42*	533*	575*	5.6072	0.1172*
PINSU	0.9719*	0	165*	165*	6.1631	0.1940*
PINU	0.6041*	118*	1103*	1221*	3.1185	0.2238*
PMA	0.9097*	56*	525*	581*	3.9078	0.1622*
RAB	0.6688*	3265*	151329*	154594*	5.6764	0.1336*
SAR	0.7638*	1775*	76425*	78200*	6.9923	0.1418*
SIF	0.5909*	988*	21655*	22643*	5.5091	0.0726
TEL	0.7734*	372*	18690*	19062*	5.1842	0.1034*
TIB	0.9158*	84*	2326*	2409*	4.4798	0.0500
TSI	0.6330*	3305*	158724*	162029*	5.1996	0.0639
TSIC	0.9036*	211*	5203*	5413*	5.8785	0.1030*
TSKB	0.8284*	0	208*	208*	5.8579	0.2093*
TUDD	0.7159*	2672*	131630*	134302*	5.5913	0.0896*
YAS	0.6392*	3560*	172062*	175622*	6.7781	0.0485
YKB	0.6444*	595*	10463*	11058*	3.8429	0.0462

"*" represents significance at 5% level.

TABLE A.20
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
AKC	0.8849*	1152*	59691*	60843*	7.3644	0.0510*
ALAK	0.6725*	7558*	476622*	484180*	5.6482	0.1149*
ANA	0.9068*	541*	16291*	16832*	5.1887	0.0392
ARC	0.6274*	6264*	245507*	251771*	4.7643	0.0472
BAG	0.6376*	14708*	1523307*	1538015*	5.6492	0.0847*
BOL	0.5230*	9979*	470997*	480976*	5.4845	0.0221
BRI	0.8624*	1860*	110200*	112060*	4.9977	0.0749*
CAN	0.8215*	2279*	117377*	119657*	6.6195	0.0849*
CEL	0.8045*	2092*	81450*	83542*	5.6108	0.0550*
CIMS	0.8071*	3682*	256174*	259856*	5.0542	0.0810*
CUK	0.7019*	3840*	137276*	141116*	6.8855	0.0960*
DEN	0.8998*	825*	35583*	36408*	5.6740	0.0700*
DEVA	0.6145*	11621*	875193*	886814*	5.4187	0.0698*
DOK	0.7794*	2791*	108038*	110829*	5.1379	0.0596*
ECZ	0.5343*	6493*	392594*	399087*	4.9861	0.0737*
EGEB	0.7362*	7355*	601964*	609319*	5.6753	0.0408
EGEG	0.8264*	2812*	182432*	185244*	4.0573	0.0214
ENK	0.8374*	1093*	23871*	24964*	6.2225	0.0797*
ERE	0.4232*	33378*	4204884*	4238262*	3.3088	0.0266
GOOD	0.8675*	1206*	45285*	46491*	5.7139	0.0572*
GUB	0.9691*	0	299*	299*	4.7322	0.0555*
GUN	0.8920*	1183*	55677*	56860*	7.8854	0.0797*
HEK	0.8187*	1500*	40560*	42060*	5.5658	0.0296
IZM	0.8816*	1288*	66789*	68077*	5.9252	0.0569*
IZO	0.7637*	2659*	86360*	89019*	5.1960	0.0405
KAR	0.8431*	1584*	68915*	70499*	5.9533	0.0395
KAV	0.7337*	2946*	88764*	91710*	5.0424	0.0589*
KEP	0.8112*	1783*	65887*	67670*	5.4968	0.0425
KOCH	0.6514*	6955*	350698*	357653*	4.9925	0.0781*
KOCY	0.8353*	1827*	72210*	74037*	4.3489	0.0708*
KORD	0.8970*	441*	10900*	11342*	6.1628	0.0636*
KORU	0.7160*	8770*	780935*	789705*	4.7373	0.0737*
KOY	0.5328*	24774*	3014121*	3038895*	3.9841	0.0353
MARE	0.9286*	336*	8234*	8570*	5.1352	0.0691*
MARM	0.9749*	1	366*	367*	6.2729	0.0491
MEN	0.7687*	4317*	256423*	260740*	6.1093	0.0384
NAS	0.9778*	6*	522*	529*	5.6503	0.0410
NET	0.9413*	209*	6021*	6230*	4.1159	0.0428
OLM	0.7353*	7327*	595918*	603245*	5.0199	0.0454

"*" represents significance at 5% .

(table con'd)

TABLE A.20
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR NORMALITY AND WHITE NOISE PROCESSES

	W	S	K	KS	κ	B
OTO	0.9153*	320*	5748*	6068*	6.4782	0.0862*
PIN	0.9699*	1428*	62211*	63639*	6.4399	0.0517*
PINE	0.9579*	11*	766*	777*	7.6647	0.0572*
PINSU	0.9747*	0	274*	274*	6.9813	0.0461
PINU	0.9465*	0	128*	128*	5.0306	0.1093*
PMA	0.9687*	27*	768*	795*	5.2867	0.1088*
RAB	0.8532*	1792*	121180*	122972*	7.7964	0.0811*
SAR	0.5437*	24131*	2927189*	2951319*	4.2332	0.0345
SIF	0.9185*	425*	10496*	10921*	6.3048	0.0776*
TEL	0.8189*	3419*	225252*	228671*	5.1177	0.0750*
TIB	0.9167*	419*	10728*	11147*	5.8332	0.1244*
TSI	0.7940*	2720*	110388*	113108*	5.3651	0.0385
TSIC	0.7243*	6299*	419122*	425421*	7.2439	0.0856*
TSKB	0.9644*	25*	785*	810*	6.4883	0.0697*
TUDD	0.8558*	1075*	28074*	29149*	6.5394	0.0867*
YAS	0.9079*	374*	9386*	9760*	7.6787	0.0454
YKB	0.8857*	579*	15431*	16010*	5.6897	0.0884*

"*" represents significance at 5% level.

TABLE A.21
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
OTO	3.142	0.832	0.205
PIN	1.768	2.398	0.114
PINE	0.141	0.011	3.944*
PINSU	1.267	2.003	0.252
PINU	0.035	0.117	0.147
PMA	31.038*	16.489*	4.843*
RAB	0.029	2.827	2.382
SANT	38.946*	56.911*	26.020*
SAR	0.610	6.352*	0.020
SIF	0.015	0.007	1.085
TEL	14.757*	16.327*	5.986*
TIB	0.129	0.024	6.964*
TSI	0.000	0.963	3.804
TSIC	0.020	0.459	1.258
TSKB	0.197	0.002	0.440
TUDD	0.795	6.593*	2.941
YAS	0.010	0.090	4.886*
YKB	0.016	0.001	4.359*

"*" represents significance at 5% level.

$\chi^2(1) = 3.84146$

TABLE A.22
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
AKC	0.271	5.323*	17.766*
ALAK	0.002	0.249	0.135
ANA	0.001	1.454	0.099
ARC	0.001	0.083	3.210
BAG	0.003	0.714	1.578
BOL	0.006	0.383	0.287
BRI	0.012	0.228	0.035
CAN	0.051	0.071	2.577
CEL	0.020	0.013	2.222
CIMS	0.006	0.171	2.356
CUK	0.000	0.192	2.352
DEN	5.562*	6.997*	0.442
DEVA	0.022	0.018	2.417
DOK	0.246	0.084	1.518
ECZ	3.952*	5.860*	0.000
EGEB	0.011	0.016	0.322
EGEG	0.003	0.027	0.017
ENK	0.962	2.229	0.138
ERE	0.001	0.019	0.378
GOOD	0.489	0.576	0.142
GUB	40.006*	3.075	2.695
GUN	0.050	0.021	8.016*
HEK	0.074	0.323	0.001
IZM	0.669	0.264	2.948
IZO	0.000	0.300	0.373
KAR	0.206	2.480	0.946
KAV	0.146	0.012	1.658
KEP	0.001	0.013	0.774
KOCH	0.001	0.099	0.743
KOCY	0.002	0.108	14.916*
KORD	0.790	0.059	0.011
KORU	0.016	0.615	7.656*
KOY	0.000	0.798	7.226*
MARE	0.433	0.393	8.364*
MARM	15.025*	0.807	12.571*
MEN	0.098	0.005	2.488
NAS	3.660	2.909	0.044
NET	0.055	1.102	0.977
OLM	0.000	0.760	4.090*

"*" represents significance at 5% level.

$\chi^2(1)=3.84146$

(table con'd)

TABLE A.22
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR HETEROSKEDASTICITY

	ARCH TEST	B.P.G TEST	HARVEY'S TEST
OTO	0.807	0.015	13.281*
PIN	0.026	1.837	1.495
PINE	5.663*	1.264	25.368*
PINSU	16.755*	1.121	77.433*
PINU	12.328*	0.037	7.507*
PMA	0.000	0.010	0.043
RAB	0.093	0.034	3.445
SANT	0.001	0.206	0.122
SAR	0.005	1.307	0.241
SIF	0.014	0.926	0.205
TEL	0.010	0.666	11.992*
TIB	1.429	2.280	1.024
TSI	11.799*	1.427	3.611
TSIC	0.028	0.231	0.100
TSKB	0.000	0.758	1.512
TUDD	0.094	0.469	8.596*
YAS	0.094	0.469	8.596*
YKB	0.036	0.030	4.134*

"*" represents significance at 5% level.

$\chi^2(1) = 3.84146$

TABLE A.23
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6) D	LB(6) D^2	LB(6) $\|D\|$	AUTOCORRELATION FOR LAG -1 D	D^2	$\|D\|$
AKC	2.43	0.03	9.17	0.027	0.001	0.109*
ALAK	9.54	0.59	0.76	0.171*	-0.042	0.113*
ANA	6.11	8.07	29.50*	0.010	0.111*	0.239*
ARC	12.04	2.04	41.73*	0.132*	0.066	0.234*
BAG	0.59	0.03	0.80	0.025	-0.002	0.040
BOL	3.10	50.60*	58.53*	0.073	0.314*	0.325*
BRI	1.52	0.11	7.03	-0.070	0.011	0.139*
CAN	34.53*	22.50*	23.10*	0.497*	0.453*	0.352*
CEL	8.82	0.20	27.35*	0.079	0.016	0.186*
CIMS	15.60*	0.22	22.41*	0.161*	0.015	0.185*
CUK	6.89	0.21	24.25*	0.123*	0.020	0.203*
DEN	9.74	4.12	8.10	0.044	-0.071	-0.086*
DEVA	1.30	0.12	2.31	0.023	0.000	0.111*
DOK	7.47	0.06	9.02	0.093	0.004	0.137*
ECZ	17.73*	1.69	13.35*	0.116*	0.039	0.137*
EGEB	7.17	104.21*	117.57*	0.032	0.242*	0.257*
EGEG	3.92	0.07	6.61	0.099*	0.004	0.082
ENK	5.46	0.40	6.00	0.127*	-0.007	0.079
ERE	22.69*	43.08*	161.80*	0.145*	0.227	0.376*
GOOD	7.33	0.06	18.64*	0.102*	0.001	0.101*
GUB	2.59	45.06*	67.34*	0.060	0.315*	0.333*
GUN	5.73	32.38*	55.32*	-0.035	0.269*	0.311*
HEK	2.07	35.02*	54.06*	0.016	0.116*	0.159*
IZM	9.82	0.44	33.45*	0.038	0.022	0.181*
IZO	8.11	0.01	7.73	0.130*	-0.000	0.105*
KAR	2.96	0.05	12.00	0.017	-0.004	0.074
KAV	1.73	0.04	4.27	0.002	-0.004	0.066
KEP	3.65	0.50	13.10*	0.035	-0.010	0.076
KOCH	11.87	1.41	27.23*	0.054	0.028	0.197*
KOCY	7.03	0.21	28.29*	-0.026	0.019	0.201*
KORD	4.16	0.38	9.48	-0.002	-0.004	0.121*
KORU	4.66	0.25	27.80*	0.095*	-0.003	0.138*
KOY	10.43	9.24	4.03	0.079	0.007	0.048
MARE	8.00	9.06	13.12*	-0.050	0.041	0.076
MARM	8.45	4.92	45.82*	0.081	0.073	0.254*
MEN	3.96	0.28	0.62	0.022	-0.021	-0.026
NAS	1.49	0.05	17.68*	0.023	-0.005	0.107*
NET	1.02	0.13	0.12	-0.054	-0.018	-0.009
OLM	7.20	0.37	18.91*	0.094*	0.025	0.178*

"*" represents significance at 5% level.

$X^2(6)=12.5916$

(table con'd)

TABLE A.23
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6)	LB(6)	LB(6)	AUTOCORRELATION FOR LAG -1		
	D	D^2	|D|	D	D^2	|D|
OTO	8.35	27.07*	68.28*	0.058	0.083	0.184*
PIN	16.43*	5.64	21.86*	-0.053	0.065	0.177*
PINE	9.40	1.22	15.52*	0.096*	0.070	0.217*
PINSU	30.75*	23.06*	40.95*	0.168*	0.148*	0.255
PINU	4.59	0.24	0.42	-0.186*	-0.026	0.010
PMA	14.75*	16.90*	14.41*	0.209*	0.276*	0.217*
RAB	15.80*	0.52	27.69*	0.168*	0.024	0.182*
SAR	14.78*	1.59	29.36*	0.177*	0.061	0.266*
SIF	5.71	0.04	3.65	0.062	-0.003	0.095*
TEL	5.34	8.94	49.26*	0.094*	0.152*	0.282*
TIB	4.69	1.06	40.63*	-0.016	0.017	0.155*
TSI	8.97	1.14	8.13	0.034	-0.002	0.069
TSIC	8.71	0.58	12.49	0.123*	0.013	0.131*
TSKB	5.69	2.06	1.29	0.190*	-0.086	-0.092*
TUDD	11.38	0.93	38.12*	0.089*	0.031	0.202*
YAS	4.64	0.07	3.21	-0.000	-0.005	0.042
YKB	1.63	0.17	1.31	0.018	-0.014	0.026

"*" represents significance at 5% level.

$X^2(6)=12.5916$

TABLE A.24
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6)	LB(6)	LB(6)	AUTOCORRELATION FOR LAG -1		
	D	D^2	|D|	D	D^2	|D|
AKC	7.60	0.51	60.07*	0.035	0.023	0.184*
ALAK	25.82*	0.04	10.90	0.162*	0.000	0.083*
ANA	6.83	0.08	14.40*	0.021	0.001	0.080*
ARC	3.12	0.09	12.67*	0.060	-0.000	0.088*
BAG	12.22	0.06	18.69*	0.108*	0.008	0.120*
BOL	1.47	0.08	3.63	-0.016	-0.003	0.036
BRI	9.17	0.25	32.44*	0.064	-0.002	0.097*
CAN	16.28*	0.05	11.48	0.076	-0.003	0.124*
CEL	5.74	0.15	13.96*	0.062	0.003	0.093*
CIMS	16.60*	0.23	55.73*	0.079*	-0.003	0.097*
CUK	11.81	0.14	4.91	0.113*	-0.003	0.058
DEN	10.44	1.90	59.68*	0.099*	0.045	0.185*
DEVA	7.04	0.05	5.16	0.084*	-0.003	0.048
DOK	4.49	0.13	9.26	0.073	0.001	0.092*
ECZ	6.63	6.63	32.13*	-0.089*	0.094*	0.194*
EGEB	4.58	0.02	30.18*	0.024	0.001	0.115*
EGEG	1.88	0.07	13.40*	-0.002	-0.002	0.101*
ENK	13.11*	0.18	39.95*	0.089*	0.013	0.147*
ERE	2.14	0.01	2.83	0.009	-0.000	0.045
GOOD	5.88	1.06	93.87*	0.048	0.012	0.157*
GUB	8.56	100.01*	125.11*	0.056	0.256*	0.293*
GUN	9.72	0.30	48.83*	0.082*	-0.004	0.111*
HEK	2.67	1.53	27.46*	0.020	0.005	0.093*
IZM	5.02	0.25	86.50*	0.063	0.011	0.170*
IZO	2.92	0.24	10.25	-0.017	0.001	0.089*
KAR	1.91	0.42	61.23*	0.028	0.020	0.208*
KAV	6.78	0.15	19.56*	0.056	0.006	0.077
KEP	5.82	0.16	11.49	0.020	0.001	0.089*
KOCH	10.23	0.14	2.43	0.096*	-0.006	0.022
KOCY	9.76	0.05	30.74*	0.095*	0.000	0.089*
KORD	8.30	0.68	81.97*	0.068	0.022	0.180*
KORU	11.76	0.03	12.25	0.059	-0.002	0.043
KOY	6.27	0.02	7.09	-0.010	0.001	0.073
MARE	8.14	0.61	25.03*	0.067	0.012	0.143*
MARM	6.62	40.39*	63.93*	0.022	0.149*	0.166*
MEN	11.43	0.21	50.77*	0.019	0.007	0.139*
NAS	4.83	17.38*	35.16*	0.009	0.068	0.163*
NET	9.19	1.06	73.28*	0.013	0.007	0.159*
OLM	4.18	0.04	11.46	0.035	-0.001	0.062

"*" represents significance at 5% level.

$X^2(6)=12.5916$

(table con'd)

TABLE A.24
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR LINEAR AND NONLINEAR DEPENDENCE

	LB(6)	LB(6)	LB(6)	AUTOCORRELATION FOR LAG -1		
	D	D^2	$\|D\|$	D	D^2	$\|D\|$
OTO	10.35	0.96	43.51*	0.106*	0.026	0.175*
PIN	10.77	0.61	40.76*	0.103*	0.018	0.158*
PINE	6.47	23.35*	79.38*	0.053	0.112*	0.228*
PINSU	12.37	54.48*	68.03*	0.004	0.157*	0.159*
PINU	15.48*	74.69*	61.66*	0.136*	0.179*	0.159*
PMA	15.71*	4.00	8.11	0.135*	-0.002	0.052
RAB	10.40	0.18	36.89*	0.103*	0.014	0.167*
SAR	4.96	0.03	10.84	-0.018	0.005	0.108*
SIF	10.79	0.17	12.22	0.099*	-0.002	0.060
TEL	9.68	0.02	18.95*	0.069	0.002	0.105*
TIB	26.88*	2.96	94.41	0.170*	0.024	0.136*
TSI	4.46	0.20	26.84*	0.038	0.011	0.135*
TSIC	8.64	0.06	5.03	0.100*	-0.005	0.001
TSKB	8.67	30.98*	109.09*	0.080*	0.123*	0.244*
TUDD	17.20*	0.11	33.60*	0.117*	0.006	0.115*
YAS	10.51	0.58	23.04*	0.025	0.011	0.108*
YKB	9.95	0.09	45.29*	0.104*	-0.004	0.127*

"*" represents significance at 5% level.

$X^2(6)=12.5916$

TABLE A.25
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR UNIT ROOT

	A.D.F.P $\alpha_1=0$	A.D.F.DP $\alpha_1=0$	P.P.P $\alpha_1=0$	P.P.DP $\alpha_1=0$
AKC	-2.8592	-5.7047*	-2.6776	-19.5510*
ALAK	-1.2590	-3.9287*	-1.2590	-4.8318*
ANA	-1.8795	-4.7451*	-0.9179	-18.5960*
ARC	-2.3496	-4.8824*	-3.7805*	
BAG	-2.2348	-5.6054*	-2.5287	-19.4500*
BOL	-1.0959	-5.2211*	-1.6580	-16.9840*
BRI	-2.7367	-3.6153*	-2.4520	-14.8840*
CAN	-2.8848	-3.5688*	-5.0452*	
CEL	-3.6491*		-4.9312*	
CIMS	-2.5721	-6.5220*	-2.5721	-16.8230*
CUK	-1.9209	-5.6544*	-2.6168	-17.5230*
DEN	-0.5941	-4.0456*	-3.7305*	
DEVA	-2.0452	-5.4243*	-3.3498	-12.0300*
DOK	-1.9265	-4.7123*	-3.0658	-17.9840*
ECZ	-6.6922*		-2.2959	-16.9900*
EGEB	-1.6585	-5.4894*	-3.5053*	
EGEG	-2.2072	-4.0383*	-3.2372	-17.5550*
ENK	-2.6730	-5.8819*	-2.6730	-10.8570*
ERE	-2.3741	-5.7574*	-4.8931*	
GOOD	-2.3480	-5.8527*	-2.3480	-18.0390*
GUB	-3.5544*		-6.3490*	
GUN	-2.1707	-4.8234*	-2.0144	-17.5770*
HEK	-1.6294	-6.7165*	-1.6294	-18.8670*
IZM	-3.0727	-4.5321*	-5.0317*	
IZO	-3.3162	-6.2985*	-3.8310*	
KAR	-1.3752	-6.4876*	-1.3752	-19.9720*
KAV	-2.4285	-5.3126*	-3.2209	-18.4350*
KEP	-2.9705	-5.7822*	-2.9705	-17.6300*
KOCH	-3.2265	-6.4913*	-5.4400*	
KOCY	-2.5249	-4.5874*	-1.6404	-20.6640*
KORD	-1.7753	-5.3479*	-4.3969*	
KORU	-3.4487*		-3.2053	-17.9460*
KOY	-3.9602*		-6.1777*	
MARE	-1.2888	-4.2691*	-3.1317	-14.3100*
MARM	-3.2997	-4.6822*	-10.6800*	
MEN	-1.6025	-4.1632*	-2.1867	-10.6300*
NAS	-2.0531	-6.4129*	-4.6037*	

Dickey Fuller critical value (5%)=-3.42

(table con'd)

TABLE A.25
DAILY DATA (BEFORE AUGUST 11, 1989)
TESTS FOR UNIT ROOT

	A.D.F.P α_1=0	A.D.F.DP α_1=0	P.P.P α_1=0	P.P.DP α_1=0
NET	-2.2751	-5.0010*	-2.2751	-8.0530*
OLM	-2.1559	-5.3509*	-2.4988	-17.5620*
OTO	-2.1866	-5.5195*	-2.1812	-18.7230*
PIN	-1.4531	-5.7586*	-1.6707	-21.3350*
PINE	-1.8509	-4.3898*	-9.2387*	
PINSU	-2.9335	-3.4666*	-2.8826	-12.6740*
PINU	-3.2581	-3.4273*	-4.6075*	
PMA	-1.9323	-4.1050*	-2.7180	-11.0080*
RAB	-6.0211*		-3.1299	-17.1160*
SAR	-1.2410	-6.0293*	-1.0487	-16.3270*
SIF	-1.8611	-5.4698*	-3.9059*	
TEL	-2.3824	-4.5283*	-2.3941	-16.8150*
TIB	-2.6831	-6.1506*	-2.1958	-19.8820*
TSI	-2.2982	-3.7617*	-2.8103	-17.8160*
TSIC	-3.1553	-4.0474*	-4.4161*	
TSKB	-1.7974	-5.3189*	-2.6233	-6.1271*
TUDD	-2.0623	-4.7395*	-5.1491*	
YAS	-2.3519	-4.1862*	-2.9259	-19.8490*
YKB	-2.5214	-4.1963*	-2.5214	-11.3400*

Dickey Fuller critical value (5%)=-3.42

TABLE A.26
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR UNIT ROOT

	A.D.F.P $\alpha_1=0$	A.D.F.DP $\alpha_1=0$	P.P.P $\alpha_1=0$	P.P.DP $\alpha_1=0$
AKC	-3.5448*		-3.8590*	
ALAK	-4.6849*		-10.8170*	
ANA	-2.5669	-4.7523*	-8.5196*	
ARC	-1.8185	-6.0238*	-7.9696*	
BAG	-3.2302	-5.4767*	-8.0148*	
BOL	-3.5233*		-10.9530*	
BRI	-3.3458	-4.7985*	-3.4625*	
CAN	-3.2516	-5.4406*	-4.5999*	
CEL	-2.8257	-6.3903*	-4.0671*	
CIMS	-2.6464	-5.4720*	-8.7736*	
CUK	-3.7941*		-6.9660*	
DEN	-4.5015*		-11.0650*	
DEVA	-2.8888	-5.5597*	-8.0793*	
DOK	-2.8707	-4.7570*	-4.3346*	
ECZ	-2.1832	-6.2400*	-4.6526*	
EGEB	-1.7723	-4.9105*	-8.3301*	
EGEG	-3.6013*		-5.8468*	
ENK	-3.6618*		-8.5046*	
ERE	-2.4931	-6.4942*	-8.0828*	
GOOD	-2.8002	-4.9745*	-10.0310*	
GUB	-4.3677*		-11.6920*	
GUN	-3.0095	-5.2798*	-8.6296*	
HEK	-2.7347	-4.7606*	-6.6586*	
IZM	-2.7954	-4.8887*	-6.8022*	
IZO	-3.7825*		-4.9040*	
KAR	-3.5335*		-3.6810*	
KAV	-4.5965*		-5.3664*	
KEP	-2.5667	-5.1380*	-3.3059	-26.4690*
KOCH	-4.0097*		-16.3620*	
KOCY	-2.7570	-4.9798*	-3.3774	-24.8030*
KORD	-3.0030	-4.5540*	-10.3960*	
KORU	-3.5988*		-7.1276*	
KOY	-1.7141	-5.6530*	-9.5850*	
MARE	-2.9420	-5.1602*	-2.8125	-25.5310*
MARM	-4.2820*		-11.4090*	
MEN	-3.6824*		-8.0887*	
NAS	-4.2568*		-7.1413*	

Dickey Fuller critical value (5%)=-3.42

(table con'd)

TABLE A.26
DAILY DATA (AFTER AUGUST 11, 1989)
TESTS FOR UNIT ROOT

	A.D.F.P $\alpha_1=0$	A.D.F.DP $\alpha_1=0$	P.P.P $\alpha_1=0$	P.P.DP $\alpha_1=0$
NET	-2.3442	-5.7874*	-4.0582*	
OLM	-2.7345	-4.8964*	-8.8186*	
OTO	-4.0064*		-6.6686*	
PIN	-3.0245	-5.3720*	-13.4660*	
PINE	-3.5160*		-8.1969*	
PINSU	-3.5167*		-11.5490*	
PINU	-2.6299	-4.4573*	-2.6299	-24.6350*
PMA	-3.0938	-5.2891*	-3.1602	-23.3600*
RAB	-3.9614*		-6.7874*	
SAR	-3.8565*		-6.1301*	
SIF	-3.5843*		-7.4308*	
TEL	-3.2278	-4.6885*	-9.0248*	
TIB	-2.9137	-6.2646*	-11.9680*	
TSI	-5.2333*		-6.9334*	
TSIC	-3.8414*		-13.6240*	
TSKB	-1.0612	-5.1102*	-5.6577*	
TUDD	-4.4886*		-10.3110*	
YAS	-2.0987	-5.7958*	-2.3402	-26.6140*
YKB	-1.6319	-5.1806*	-4.2710*	

Dickey Fuller critical value (5%)=-3.42

VITA

Ayse Yuce was born on July 7, 1955. She received B.S degree in Chemical Engineering from Bogazici University, Turkey in 1978. Between 1979 and 1986 she worked as the chief chemical engineer at CBS Paint Factory. In 1989 she got an MBA degree from the University of Southern Mississippi at Hattiesburg. In 1989 she started her Ph.D degree in the finance department of the Louisiana State University and got the degree in December 1993.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Ayse Yuce

Major Field: Business Administration (Finance)

Title of Dissertation: An Examination of an Emerging Stock Exchange: The Case of the Turkish Stock Market

Approved:

Geoffrey Booth

Major Professor and Chairman

Daniel Fogel

Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:

November 8, 1993